MINISTRY OF ECONOMY, TRADE AND ENERGY (METE)
REPUBLIC OF ALBANIA

THE STUDY FOR THE MASTER PLAN FOR PROMOTING THE MINING INDUSTRY OF ALBANIA

FINAL REPORT

November 2010

JAPAN INTERNATIONAL COOPERATION AGENCY

MITSUBISHI MATERIALS TECHNO CORPORATION
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PREFACE

In response to a request from the Government of the Republic of Albania, the Government of Japan decided to conduct "The study for the Master Plan for Promoting the Mining Industry in Albania" and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA selected and dispatched a study team, headed by Mr. Yoshiaki Shibata of Mitsubishi Materials Techno Corporation, consisting of experts from Mitsubishi Materials Techno Corporation and Kokusai Kogyo Co., Ltd., for six times between a period from May 2009 to November 2010.

The study team held discussion with the officials concerned of the Government of the Republic of Albania and conducted field study in Albania. Upon returning to Japan, the team conducted further studies and the final report was completed.

I hope that this report will contribute to the promotion of mining development of the Republic of Albania and also to the enhancement of friendly relationship between two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Albania for their close cooperation extended to the study.

Ms. Kyoko Kuwajima
Director General
Industrial Development Department
Japan International Cooperation Agency

November 2010

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Ms. Kyoko Kuwajima
Director General
Industrial Development Department
Japan International Cooperation Agency

Letter of Transmittal

Dear Sir,

We are pleased to submit herewith the final report of "The Study of the Mater Plan for Promoting the Mining Industry of Albania".

The targets for the mining sector of Albania are recovery and increase of productions by restructuring the mining sector and one of the important strategies launched by the Government of Albania is to implement reformation of the mining sectors. However, in addition to the currently facing problems of legislation, government policies and institutions, problems are also found in supporting structures, such as technical capability, manpower and improvement of infrastructure.

The main objective of the study, conducted during a period from May 2009 to November 2010, is to formulate the comprehensive master plan by clarifying a roadmap to realize sustainable development of mining industry under circumstances of economic transition to privatization and market-oriented economy. We hope that the master plan, together with the recently inaugurated new mining laws, will contribute greatly to sustainable development of mining sector of Albania.

We wish to take this opportunity to express sincere gratitude to the officials of your Agency, the Ministry of Industry, Trade and Economy, the Ministry of Foreign Affairs and Japanese Embassy in Rome and JICA Balkan Office for their kind support and advice. We, also, would like to show our appreciation to the officials of the Albanian government institutions, such as the Ministry of Economy, Trade and Energy, National Agency of Natural Resources, Albanian Geological Survey and the Ministry of Environment, Forests and Water Administration for their kind cooperation and assistance throughout the study in Albania.

Finally, we hope that our outputs will contribute to development of mining sector of the Republic of Albania and to fostering a long-lasting partnership and friendship between Japan and the Republic of Albania. .

Yours faithfully,

Yoshiaki Shibata
Leader of the JICA Study Team

Location Map of Albania

Concept of the study for Master Plan in Albania

SUMMARY

1. Introduction and Aims of this Summary Document

The overall direction of the development of the mining sector in Albania is positive, although progress urgently needs to be stepped up. Because there is minimal public finance available for sector development, private investment money is needed for exploration, mine development, ongoing environmental protection, etc. Therefore the core direction of the mining policy is to attract private sector investment.

The aim of this document is to provide a summary of the Master Plan for Promoting the Mining Industry in Albania.

The document is structured into:

- Development strategies for specific minerals – Chromite, Copper and Nickel.
- Strategy for data management and GIS.
- Strategy for institutional and legal aspects.
- Management of environmental, health and safety, and social aspects.

Method for the development of the Master Plan

The development of the Master Plan has involved an 18 month project by technical and institutional specialists from Japan, under funding from JICA.

The team have worked closely with Albanian specialists from METE, in particular AKBN and AGS. The project has included 5 stakeholder consultation workshops to obtain wider feedback, and several meetings of smaller working groups of Albanian experts to develop specific components of the Master Plan.

2. Development Strategy - Chromite

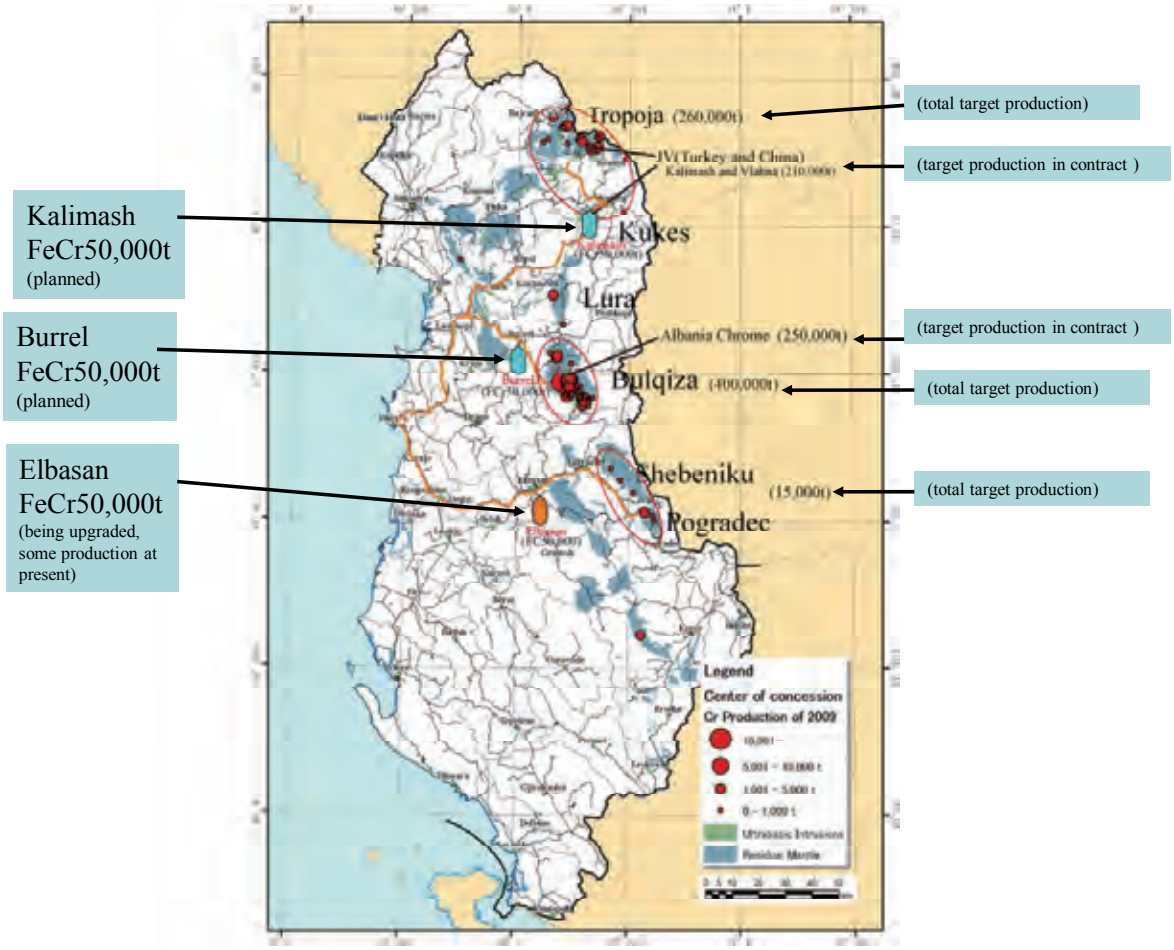
1) Key Issues - Chromite

There is still much potential for development of the remaining deposits of chromite in Albania, particularly in the Bulqiza area. However, there were as many as 163 licences in March 2009 for the exploitation of chromite, and 95% of these licences are small-scale activity (e.g. producing less than 5,000 tons each per year). Many of these small-scale companies are not being properly regulated, and there are significant health and safety risks associated with their activities.

There are two major concession contracts for chromite mining in Albania – one awarded in the Bulqiza area in 2001 and now operated by Albania Chrome, the largest mining company in Albania, and one in the Kalimash area, awarded in 2010 to a Turkey-China joint venture. As part of these contracts, smelting plant are being planned and upgraded at Elbasan, Burrel and Kalimash, although progress in development of the smelting plant has been slow.

At least 30% of the chromite ore is low-grade and needs to be concentrated. Until recently there has been only one concentration plant in the country at Bulqiza. Several of the smaller companies are planning to combine resources and develop concentration plant, and one plant has recently started operation at Batra. The Kalimash contract also requires the development of two concentration plant. However, there is no clear overall strategy for development of concentration plant and the efficiency of the system of existing plant is uncertain.

2) Chromite production areas in Albania



3) Development Strategy - Chromite

The production of chromite ore (in 2009) was 272,000 tons, and the target for 2015 is 675,000 tons. In order to achieve this target, the key components of the Master Plan include:

- Ongoing exploration activities to identify new deposits.
- Development of a structured integrated system of chromite production, including mining, concentrating and smelting activities.
- Identification of potential mineral areas for the competitive tendering of large concession contracts and attraction of international investors.
- Developing capacity to ensure a stronger focus on the monitoring and enforcement of existing (and future) contracts, particularly the enforcement of the conditions in the contracts on the development of the smelting plant (under Rehabilitate-Operate-Transfer (ROT) mechanisms).
- Implementation of a more structured strategy for the development of concentration plant, to optimise their location and size and to ensure that the system is efficient and cost-effective.
- Improving the organisation of small-scale mining in order to reduce the safety and environmental risks, taking into account the social implications, and to improve the efficiency of their operations. This is further discussed below.
- Decreasing the number of licences for chromite mining (e.g. identifying companies that have had no production for several years), through strengthening the monitoring activities at AKBN.

Reducing the safety risks from small-scale mining

Improvement of the organisation and monitoring of small-scale mining is needed, for example in the Bulqiza area, particularly to reduce the severe risks to health and safety issues. However, the management of associated social issues, such as employment, incomes, etc, need to be taken into account in planning the improvements, because these small-scale activities do provide income for local communities in poor rural areas of Albania.

The overall strategy should involve better organisation, monitoring and support to these companies, encouraging consolidation where practical. There are similar examples of successful organisation of such small-scale activities in Chile, through the organisation of co-operatives. This approach helps to support the small companies and individuals through organising the sharing of equipment and facilities, organising specific mining activities to reduce safety risks, cutting financial risks from fluctuating market prices by signing agreements with the miners to buy chromite ore within specified price levels, etc.

Initially, such tasks could make up a very useful international Technical Assistance project in future for international specialists to support the Government to improve the organisation of the small-scale mining activities, and to plan a co-operative as a pilot project. In such a Technical Assistance project, it would be important for a team of Albanian specialists to work on the tasks of information collection and interviews with small-scale miners.

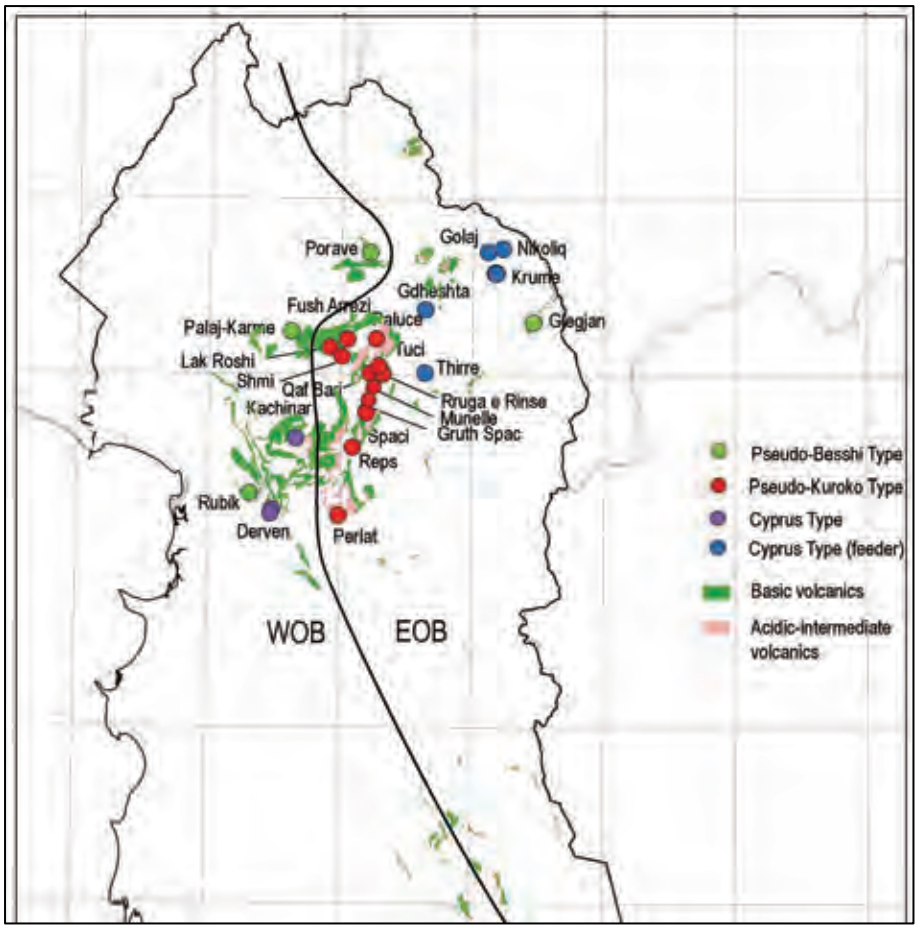
3. Development Strategy – Copper

1) Key Issues - Copper

The main known copper deposits are in northern Albania (see map below), and the JICA study has confirmed that there is particularly high potential for the Kuroko type deposits.

There is a lack of activity related to copper mining in Albania, with only 12 exploration licences and 5 exploitation licences in Albania (as of December 2009), and only 2 of the 5 exploitation licences actually involve mine operation (at Pukë), by a Turkish company. The concentrated ore is exported to smelting plant in China. However, there is significant potential to improve the mining efficiency and the efficiency of the nearby concentration plant.

Although major potential exists for expanding mining sector activities related to copper, generally there is a lack of basic data on potential deposits. Such data are needed to attract companies to invest in further exploration.



Distribution of major copper deposits(AGS data)

2) Development Strategy - Copper

The development strategy for copper involves the following:

- Carry out collection of basic geological data that would help to find promising areas and would attract private companies to invest in exploration activities. This would involve airborne geophysical surveys, satellite image analysis, regional geochemical surveys, etc. However,

funding would be needed for such activity, and METE should seek international development funding. The high potential in the Kuroko type deposits in Albania could be modelled using the Japanese Kuroko deposit model (these deposits are similar to some deposits in Japan).

- Promotion of more detailed exploration activities, such as drilling, by private sector companies.
- Enforcing more efficient mining techniques at the existing mines, so that both high grade and lower grade ore are extracted, therefore enhancing the sustainability.
- Enforcing more efficient operation of the concentration plant, increasing recovery from 85% to 90% in line with best international practices.
- Encouraging the extraction of Zinc and Lead metals at the concentration plant in order to realise the full value of the ore.
- Encouraging the re-processing of tailings to extract Zinc and Lead at the operating mines in order to gain additional value from previous mining and to reduce environmental impacts of the tailings.

The main target for the development of the copper mining in Albania should be to identify licence areas with estimated potential deposits of 10,000 to 50,000 tons (or more) of copper metal, and to competitively tender and award these contracts by 2015.

Existing copper mine (Munella mine at Pukë).

Existing copper ore concentration plant at Fushe Arrezi near Pukë.

4. Development Strategy – Nickel

1) Key Issues - Nickel

There are major mineral resources of nickel in Albania (estimated 300 million tons). The key issue with the nickel laterite deposits in Albania is that they are mainly overlain by hard rocks, and therefore relatively expensive to mine compared with many other regions in the world where nickel deposits are on the surface.

At present there is some mining of nickel in Albania, but only by small-scale Albanian companies. These companies are finding it difficult to compete in the markets.

Nickel ore is currently being transported to other countries for extraction, but the grade of ore is typically 1% so the transport process is very inefficient. There has been some interest of international companies in developing extraction facilities for nickel in Albania, and some pilot tests of some different methods have been carried out.

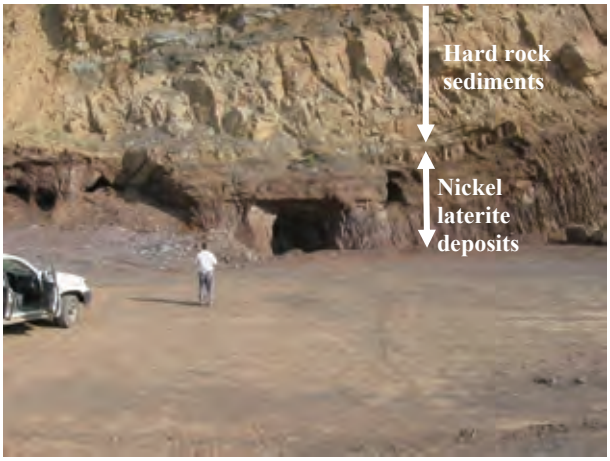


Illustration of typical nickel laterite deposits in Albania, overlain by hard rock, and therefore more expensive to mine.

2) Development Strategy - Nickel

The development strategy for nickel involves the following:

- Development of integrated production systems for value added material and reducing the major transport inefficiencies in the sector in Albania by development of extraction facilities in the country. This will need to involve a low-cost extraction process because of the relatively high cost of mining.

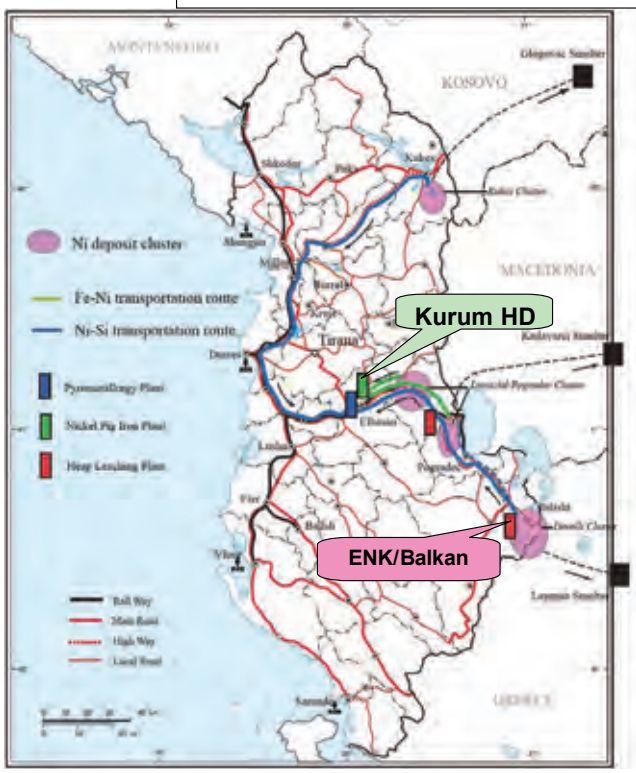
- The first step will be to identify the optimum location for the extraction plant, and particularly the type of process. For example, some types of process might need improved transport infrastructure for the import of sulphuric acid (heap leaching process). The JICA study has identified options for the types of extraction process, based on international best practices and on pilot trials in Albania in previous years.

- METE will need to encourage private investment in the development and operation of the nickel extraction plant.

- In addition, a core part of the strategy will involve attracting private mining companies to tender competitively for nickel mining contracts.

- The JICA study has confirmed that the next target area with high potential for nickel deposits is the Lura to Kukes area.

Possible Ni extraction methods in Albania



Heap leaching
Pre-FS is being conducted by ENK/BLK in Devolli cluster.

Production of Ni pig iron
Turkish steel company is considering it.

Pyrometallurgical method
Technically confirmed to be possible by pilot test.

HPAL
High-technology is necessary

CARON Method
Conducted in 1979～1992, but no good results

Exporting ore to smelting plants of neighboring countries

5. Non-metallic Mineral Development and other Issues

1) Classification schemes for ore deposits

- All the documents submitted to the government, such as applications for licences and reports of exploration work, should be in line with a new classification system that is based on international systems.

2) Development strategy for non-metallic mineral resources

- The improvement in the organisation of licences for non-metallic resources is needed, particularly to reduce the number of licences (e.g. for sandstone, limestone).

- To improve the protection of the environment, including impacts from dust, noise, and visual impacts, it is recommended that quarrying licences are restricted to specific areas and excluded from other areas.

- Clearer responsibilities and co-ordination are needed at AGS and AKBN related to the organisation of information and other activities for development of non-metallic mineral resources.

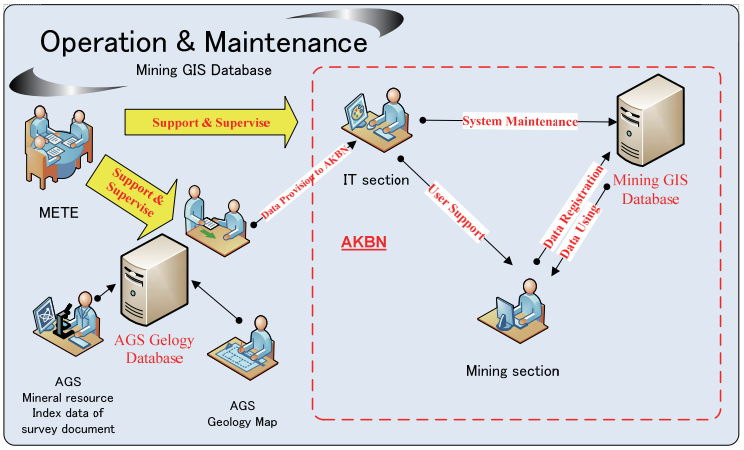
- In addition, clearer responsibilities are needed for the organisation of marketing, processing and distribution activities for decorative stones.

Numerous quarries can cause a significant cumulative impact related to noise, dust and visual impacts.

6. Strategy for Data Management and GIS

One of the important aspects of the development and improved organisation of the mining sector is to strengthen the collection and reporting of data and information. For example, reliable data and information will help to encourage and facilitate investments from private companies. It will also help the Government to plan policy decisions and actions.

The development of the Master Plan has included the concept design of a GIS database for the mining sector. This design involves the integration of the databases of METE (AGS and AKBN).



Schematic of the concept design for operation of mining GIS database

The Master Plan includes recommendations on the priorities for addressing existing data gaps:

- It is important that the development of GIS is implemented on a step-by-step basis. There are many examples in countries where major GIS systems that are over-detailed and complicated have been designed, but implementation has not been successful because of the need for a major increase in capacity and also the need for much expensive computer hardware.

- The next step will be the detailed design of the GIS database, selection of software and customisation of the software to the needs of METE and its agencies.

- Some training of Albanian personnel in GIS has been carried out in Albania and in Japan during the JICA project. However, the most important aspect of a future GIS database is to strengthen capacity in AGS and AKBN for its implementation and use. There are currently major capacity shortfalls in terms of the number of staff and the skills of the staff for GIS database management. It will be important to recruit staff and to implement detailed training programmes on GIS.

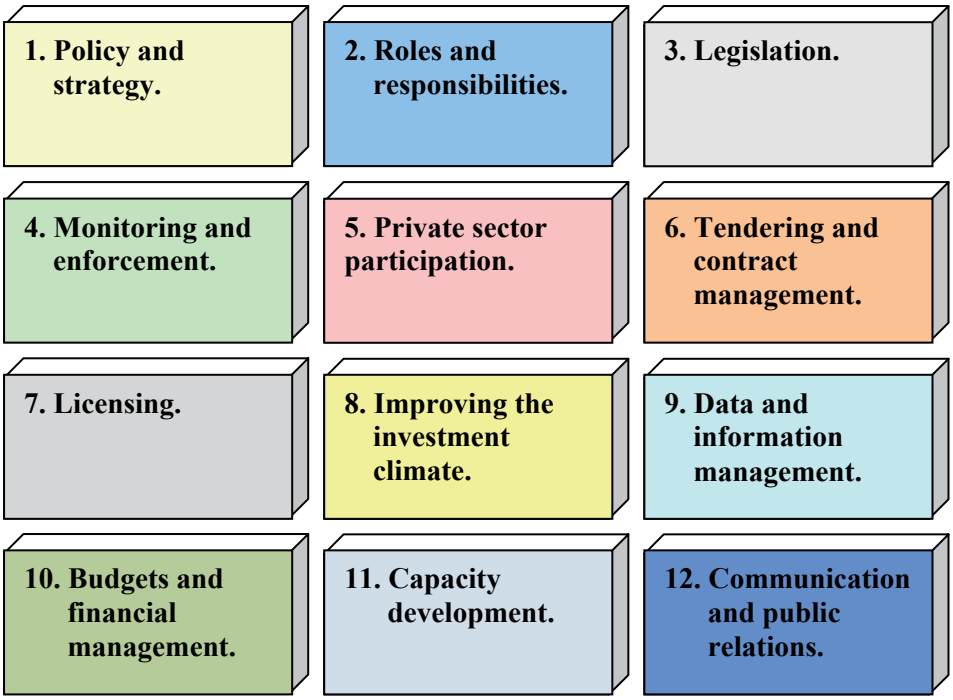
- It is important that the data and information are efficiently shared amongst institutions for their use, and that an efficient mechanism is available for potential private sector investors to easily obtain data and information. It is important for information to be clear about the data reliability.

- Responsibilities for data management and future GIS need to be clearly defined. In particular, AGS and AKBN both receive important data, from survey work, company reports, etc. Responsibilities for AGS and AKBN must be clearly defined in the future implementation of GIS so that the two agencies co-operate on improved data management and availability.

- It is recommended that METE discuss potential funding opportunities with international donor organisations for a Technical Assistance (TA) project for the development of the detailed design for the GIS database, the customisation of the software, advice on responsibilities, development of data management procedures and detailed training of personnel.

7. Strategy for Institutional and Legal Aspects

For the sustainable development and strengthening of the mining sector in Albania, it will be important to strengthen aspects related to the main components (or building blocks) of the institutional and legal framework illustrated below.



The Government of Albania has been making progress in addressing the priorities for several of these building blocks. For example, the new National Licensing Centre now provides an efficient mechanism for private investors to obtain licences. However, there are several priorities that still need to be addressed in relation to the above components of the mining sector. These priorities are discussed below.

A robust legal framework is essential to the development of the mining sector in Albania, with the alignment of national legislation to EU legislation and standards. The legislation needs good coverage of the important issues and must enforce high standards of mining activity, transparency, environmental protection, health and safety management, etc.

The New Mining Law (July 2010) provides the legal framework for strengthening the mining sector and attracting private investment:

- The New Mining Law, and the secondary legislation and strategies that are developed within the framework, will demonstrate to potential investors that Albania has a stable institutional and legal framework that lowers the risk of investment and ensures fair and transparent competition, without the risk of political interference.

- The Law sets the mechanism for development of a 3-year National Mining Strategy. This will be important to focus METE and its agencies on the priorities for sector development. It will be updated every 3 years. An annual action plan will be developed for each year, in line with the Strategy.

- The Law has a strong focus on improving the investment framework, with an important shift towards tendering for concession licences for potential mining areas, for which there is much information available. However, for areas where data on potential minerals are not yet sufficient,

the licences will be awarded to appropriate companies on a continued basis of "first-come, first-served."

The priority next steps for the actions related to the implementation of the New Mining Law include the development of secondary legislation that will provide more detail to the legal framework. For example, secondary legislation needs to include coverage of:

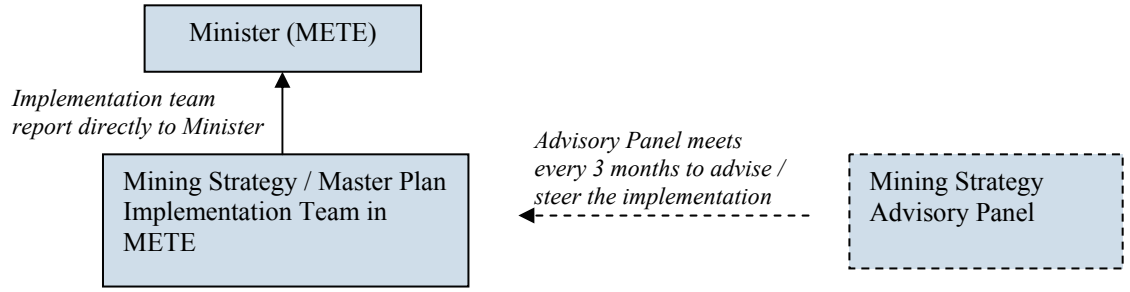
- Clarifying roles and responsibilities of Government institutions in the mining sector.
- Further improving the mining licensing requirements to encourage private sector companies to invest in the mining sector.
- Defining the framework for the tendering of concessions.
- Specifying requirements for the minimum activities that companies must carry out under their licence conditions.
- Specifying the requirements for the provision to METE by companies of data obtained during exploration.

However, strong legislation alone is not sufficient, and it is essential that the legislation is properly enforced. The capacity within the Government institutions for monitoring and enforcement is very weak (for example in AKBN for monitoring the implementation of licensing conditions, in the Mining Safety Inspection Unit for monitoring of health and safety practices, and in MEFWA for monitoring environmental protection). It is essential that capacity is strengthened for monitoring and enforcement of existing legislation, and it will need to be further improved as legislation continues to be updated to align with EU standards. Without the strengthening of capacity to implement, monitor and enforce legislation, potential private sector investors will not have the confidence that there is a fair, safe and transparent mining sector in Albania. In addition, capacity needs strengthening related to chemical laboratory analysis (e.g. AGS).

Co-operation and co-ordination between ministries is essential for sector development, for example because there are clear linkages in types of legislation, licence and permit procedures, monitoring, data management, etc. It is proposed that the implementation of the Master Plan is carried out by a team in METE that reports to the Minister, and is steered by an Advisory Panel that is represented by several relevant ministries and agencies (e.g. METE, AKBN. AGS, MEFWA, Mining Safety Inspection Unit, technical experts from universities, representatives of the private sector).

Framework and Responsibilities for Implementation

The proposed framework for the implementation of the Master Plan is illustrated below. This will also be the framework for the implementation of the 3-year Mining Strategy and 1-year Action Plan that are being developed under the requirements of the New Mining Law.



As demonstrated by the recent tendering activities for the Kalimash licence, capacity of the responsible Government institutions also needs to be strengthened related to the planned shift in approach towards tendering and contract management. Investors need to be confident that the tendering and contract management process is very well organised, fair and transparent. Some training of Albanian specialists in strategic and organisational aspects in the mining sector has been carried out in Japan during the JICA Project.

The Government of Albania is working towards adoption of the Extractive Industry Transparency Initiative (EITI), which will strengthen the auditing of financial aspects and accountability in the mining sector. Albania is a candidate country to the EITI and has until May 2011 to complete the validation process. It is important that the required actions for the implementation of EITI are taken as a priority. Compliance with EITI raises the interest and confidence of potential investors from the private sector, as has been shown in by the major investments in the oil and gas sector in Azerbaijan, which was one of the first countries to complete the validation process and step up from a candidate country to a compliant country.

There are various other aspects of attracting private sector investment including improvements in marketing and communication. The JICA Project included funding for senior directors in METE to participate in a mining sector conference and exhibition in Canada and to participate in a seminar in Japan for the promotion of investments.

One important aspect is the need for a professional and helpful initial contact point for information on the mining sector, which will also encourage private companies. Such a contact team should be made responsible, trained and promotional / marketing material developed. This should include the development of a high standard web site with information on future tenders, on the tendering and licensing procedures, etc. This contact team might be in a strengthened AlbInvest (AIDA), of a specific team in AKBN. It is important for this to be clarified and agreed as soon as possible.

8. Environmental, Health and Safety and Social Aspects

Recent high-profile global events have demonstrated the importance of high standards of environmental management, health and safety management, and social responsibility in the mining sector.

1) Environmental Management

A strong and consistent environmental management framework and good environmental practices across all companies in the mining sector is important to potential international investors, which are likely to have high standards of environmental management and protection.

The main priority for improved environmental management in the mining sector is the need for improved co-operation and co-ordination between MEFWA and METE. This includes co-operation related to the issuing and renewal processes for environmental permits and mining permits, as well as co-operation related to monitoring activities.

It is essential that all mining companies are required to comply with high environmental standards, and that these are enforced. Strengthening of monitoring and enforcement by MEFWA is needed, particularly in terms of monitoring capacity (i.e. number of inspectors). Co-operation during monitoring activities between METE (AKBN) and MEFWA will greatly enhance environmental protection practices, in particular the sharing of information between AKBN and MEFWA.

Under the New Mining Law, all companies should be required to develop the following in order to receive an environmental permit:

- Waste management plan
- Mine closure plan

It is important that the contracts with mining companies include appropriate, clear and fair conditions related to the step-by-step clean-up and rehabilitation of environmental pollution problems from historical mining activities. The implementation of the waste management plan, rehabilitation plans and the mine closure plan must be properly monitored and enforced.

There are several serious environmental problems in Albania from contaminated land and potentially polluted groundwater and surface water from past mining activities. However, there is a lack of environmental information and data related to these problems. METE should carry out a monitoring programme of environmental problems from past mining activities, so that these problems can be prioritised for remediation actions.

Copper tailings dam from past mining activities.

2) Health and safety Management

Health and safety issues are important to the potential private sector investors and the international companies are likely to have high standards related to the management of health and safety. Risks related to safety aspects, for example from small-scale mining activities that are near to potential development areas, are likely to be a major concern to private investors and a constraint to investment, because of the reputational risks. It is important for the Government of Albania to plan actions to manage and improve safety aspects related to the mining sector.

The capacity needs to be strengthened of the Mining Safety Inspection Unit for monitoring and enforcement related to health and safety in the mining sector. It is important for METE to promote the improvement of health and safety, for example, as well as strengthening monitoring and enforcement of safety practices, developing and distributing procedures and guidelines on health and safety, promoting training and awareness-raising, ensuring strict health and safety requirements are a condition of licences, and ensuring good reporting on health and safety. METE should work with the Ministry of Labour, Social Affairs and Equal Opportunities on these issues.

3) Management of Social Issues

Social issues are important to potential private sector investors because the international companies are likely to have high standards related to the management of social aspects. Risks related to social aspects, for example from small-scale mining activities that are near to potential development areas, are likely to be a major concern to private investors and a constraint to investment, because of the safety and reputational risks. It is important for the Government of Albania to plan actions to manage and improve social aspects related to the mining sector. More specific recommendations are provided in Section 2 of this Summary Document.

9. Summary of the Priority Next Steps

The priority steps for development of the mining sector are:

- ☑ Adoption of the New Mining Law.
- ☑ Development of a Master Plan for strengthening the mining sector in Albania.
- ☐ Tasks related to implementation of the New Mining Law (e.g. secondary legislation, 3-year mining strategy, 1-year mining action plan).
- ☐ Tasks related to implementation of EITI.
- ☐ Identification of opportunities for Technical Assistance (TA) funding for capacity development for implementation of the mining strategy at AKBN and AGS.
- ☐ Planning integrated systems, particularly for chromite (mining, concentration, smelting), and preparation of further tenders related to chromite mining and processing.
- ☐ Improve the organisation of small-scale mining companies, monitoring safety practices, and planning the formation of co-operatives.
- ☐ Collecting basic geological data at regional level (e.g. airborne geophysical surveys, etc) that would help to find prospective areas and would attract private companies to invest in exploration activities (particularly for copper).
- ☐ Development of plans for nickel treatment plant, including the optimum type of facility, location and size, so that tendering of build and operation can be planned.
- ☐ Identify opportunities for TA funding for specific projects to develop GIS database.
- ☐ Development of a mechanism for co-operation of MEFWA and METE in relevant mining sector activities.

10. Overview of the Master Plan for Mining Sector Development

	2011	2012	2013	2014	2015	2016
Institutional and Legal aspects						
Secondary legislation.						
3-year strategy, 1-year action plan.						
Set up strategy implementation team.						
Implementation of EITI.						
Set up Advisory Panel to improve stakeholder co-operation.						
Recruit to strengthen capacity in AKBN / AGS.						
Marketing actions to attract foreign investment.						
Training programmes – strengthening capacity AKBN / AGS.						
Development strategy – Chromite						
Develop integrated systems (mining–concentrating–smelting)						
Strengthen enforcement of existing contracts.						
Reduce the number of licences for exploitation.						
Identify areas for competitive tendering of large concessions.						
Develop plan to optimise system of concentration plant.						
Set up co-operatives for small-scale mining operators.						
Tendering of large scale concessions.						
Expansion in large-scale chromite mining operations.						
Development strategy – Copper						
Improve efficiency of existing mines.						
Improve efficiency of existing concentration plant.						
Basic exploration (e.g. airborne geophysical surveys) / modelling.						
Recover of Zn and Pb (as well as Cu) to add value.						
Reprocess tailings to recover Zn and Pb.						
Promotion of exploration by private companies.						
Tendering of concessions.						
Expansion in copper mining operations.						
Development strategy – Nickel						
Develop detailed plans for Ni treatment facility in Albania						
Encourage private sector interest in investment in extraction facility						
Encourage private sector mining activities (Lura-Kukes)						
Tendering of contract for treatment facility.						
Tendering of large scale concessions.						
Construction of treatment facility.						
Expansion in large-scale nickel mining operations.						
Operation of treatment facility.						
Database and GIS						
Procedures for co-operative work on GIS/databases (AGS/AKBN)						
Detailed design, customise software.						
Development of GIS on a step-by-step basis.						
Recruitment to form GIS teams in AGS and AKBN.						
Detailed training and capacity development on GIS						
Environmental, Health &Safety, Social aspects						
Mechanism to strengthen co-operation (METE/MEFWE)						
Plan for improving health & safety issues of small-scale mining.						
Recruit to increase number of monitoring inspectors.						
Training and capacity development for monitoring.						
Assessment study to prioritise mining pollution hotspots.						
Remediation of historical mining pollution hotspots.						

To be implemented by the government with ordinary budget (plus minimal fund)
To be implemented by the government with specially allocated budget (budget arrangement is a critical condition)
To be implemented by close communication with Government and Private Sector
Feasibility consideration should be supported by the fund of government;
further industrial implementation should be done by the investment from private sector

THE STUDY FOR THE MASTER PLAN FOR PROMOTING THE MINING INDUSTRY OF ALBANIA

FINAL REPORT

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Glossary

AGS	Albanian Geological Survey
AIDA	Albanian Investment Development Agency
AKBN	National Agency of Natural Resources (AKBN: Agjensia Kombetare e Burimeve Natyrore (in Albanian))
Albinvest	Albanian Investment Agency
CD	Capacity Development
BOT	Build, Operate and Transfer
C/P	Counterpart Personnel
DGNRDP	Directorate General of Natural Resources Development Policies (METE)
DGR	Directorate General of Regulations
DSRMI	Division of Safety and Rescue of Mining Industry
EIA	Environment Impact Assessment
EITI	Extractive Industry Transparency Initiative
EU	European Union
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GIS	Geographic Information System
GNI	Gross National Income
GoA	Government of Albania
IFC	International Finance Corporation
IFIs	International Finance Institutions
INSTAT	Institute of Statistics
IT	Information Technology
ITNPM	Institute of Mineral Extracting and Processing Technology (previous name of AKBN)
JICA	Japan International Cooperation Agency
JMEC	Japan Mining Engineering Center for International Cooperation
JOGMEC	Japan Oil, Gas and Metals National Corporation
JV	Joint Venture
LMCCD	Licenses and Management of Concessions Contracts Directory
MIGA	Multilateral Investment Guarantee Agency (World Bank)
MCC	Millennium Challenge Corporation
MEFWA	Ministry of Environment, Forests and Water Administration
METE	Ministry of Economy, Trade and Energy
M/M	Minutes of Meeting
MMAJ	Metal Mining Agency of Japan
MMTEC	Mitsubishi Materials Techno Corporation
MoF	Ministry of Finance

NANR	METE in Albanian
NEAP	National Environmental Action Plan
NGOs	Non-government organisations
NLC	National Licensing Center
NRC	National (Business) Registration Centre (QKR in Albanian)
NSDI	National Strategy for Development and Integration
NSSED	National Strategy for Socio-Economic Development (replaced by NSDI)
ODA	Official Development Assistance
OJT	On-the-Job Training
PDAC	Prospectors and Developers Association of Canada (held once in a year in March in Toronto, Canada)
REA	Regional Environment Administration
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
SME	Small to Medium sized Enterprises
S/W	Scope of Work
UNEAP	Updated National Environmental Action Plan
VMS	Volcanic Massive Sulfide
WB	World Bank

CHAPTER 1 INTRODUCTION

1.1 Preface

This Report shows the result of "The Study for the Master Plan for Promoting the Mining Industry of Albania".

The study is an international cooperation project implemented by Albanian and Japanese teams aiming at clarifying a roadmap to realize sustainable development of the mining industry under privatization and market-oriented economic reform in Albania.

1.2 Background of the Study

1.2.1 Importance of the Mining Industry in Albania

Albania has rich mineral resources such as chromium, nickel and copper. In the 1970s and 80s, it was the world's 3rd largest producer of chromites and exported significant amount of chromites to other countries including Japan.

Although the production of the mining industry has decreased since the country shifted to a market economy in 1990s, it is expected that the mining industry will again become a core industry of the country. International demand for mineral resources has been increasing in recent years and Albania has been gathering interests from investors as a promising target of mining investment. It is widely accepted that the importance of the mining industry for the Albanian economy has been more increasing.

The promotion of the mining industry provide one of strong means for acquiring foreign currency, which in turn will help to improve the quality of life in the country. It is expected that mining industry can play an effective role in improvement of the quality of life as well as the economical growth in the country.

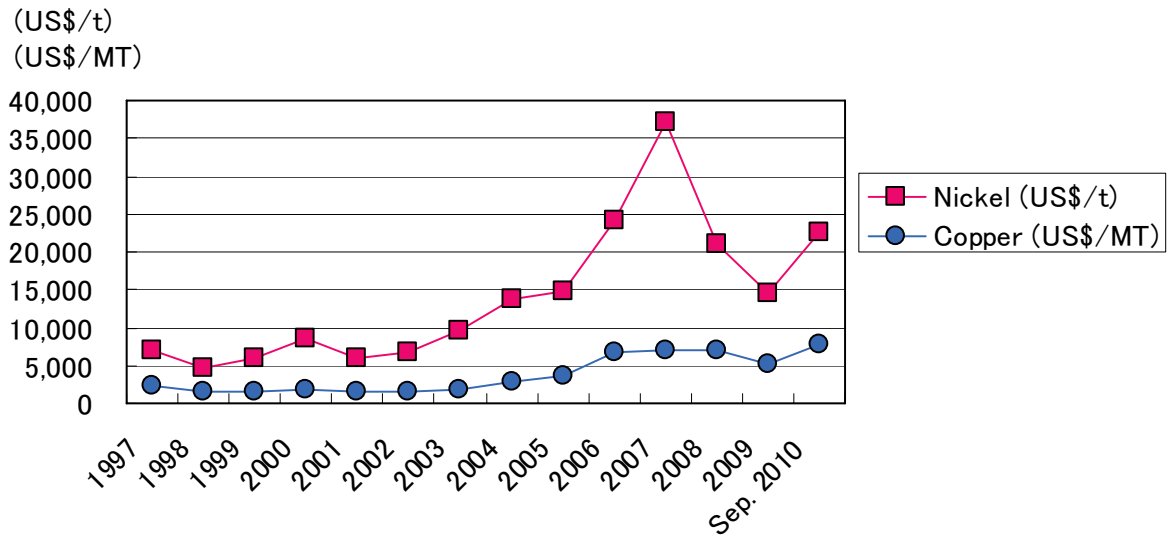


Figure 1.2.1 Copper and Nickel price charts from 1996 to 2010

1.2.2 Restructuring and Privatization of the Mining Sector in Albania

The government of Albania has been making great efforts to promote the restructuring of the mining sector through the process as follows;

- Privatization process (1994 - ongoing)
- Restructuring of state enterprises in the chromium and copper sector (1994 - 1998)
- Administration and legal framework based on laws of market economy (Albanian Mining law of 1994)
- One-stop licensing process on mining activity (2006 - ongoing)
- Concession on the assets of mining industry (1995)
- losing inefficient mines and conserving potential mines (1993 - ongoing)

As the result of the above-mentioned restructuring processes, almost of all of the mining enterprises have been privatized, with only three state enterprises remaining at the moment. Up to March 2010, 785 mining permits have been issued, among which, 651 are exploitation mining permits. Since the Concession Law was approved in 1995, concessions are given to some foreign private companies such as Italian company "DARFO" who transferred shares to the Austrian-Russia joint venture company "DCM+Terwing and Turkish company BER-ALB".

1.2.3 Legal Framework of the Mining Industry in Albania

"The Mining Law of Albania" was enforced at 17th February, 1994 and the Law was amended in 2004 and 2007. The title of the law was changed into "ALBANIA MINING LAW". The strategy of the mining industry development was prepared in 2004 and it was adopted in the National Strategy of Development in 2007. The Ministry of Economy, Trade and Energy (METE) was carried out another revision of the Mining Law and the strategy in cooperation with the World Bank, and the New Mining Law was approved at the Parliament on 15 July 2010.

1.2.4 Activities of the World Bank in the Mining Sector of Albania

The World Bank is a main donor in the sector that has been offering technical assistant supports to revise the Mining Law and the strategy of the mining industry development. Since the volume of input of the World Bank's revision works is very limited at this time, it is expected that there would not be drastic changes in the Law and the strategy as the result of the works. An implementation of the 2nd phase technical assistant support following the on-going revision works is not yet proposed by the World Bank.

1.2.5 Issues for Further Promotion of the Mining Industry in Albania

As the result of continuous efforts made by METE and other related organizations since 1980s and due to the current active market of mineral resources, the main minerals production in Albania has been increasing gradually in recent years. Especially, the annual production of chromium in 2007 was 325,000 tons which is two times as much as the figure in 2006. However, comparing to the production in 1980s, the production of chromites in 2007 is still very small amount. This fact shows that further promotion of the mining industry should be carried out based on a long-term plan and a clear strategy under the strong leadership of METE. Analyzing the current situation in 2007, where METE has no comprehensive plan and useful tools for the promotion of the mining industry, METE recognized that the following items are needed to be established in order to promote the mining industry skilfully.

- Comprehensive Master Plan for the promotion of the mining industry including individual promotion strategies for each mineral resource such as chromium, nickel, copper etc.
- Useful GIS based database on mineral resources for planning and executing the Master Plan

1.3 Objectives of the Study

The main objective of the study is to clarify a roadmap to realize sustainable development of mining industry under privatization and market-oriented economic reform.

1.4 Outputs of the Study

The main output of the study is a Final Report of the project. The report contains Master Plan for sustainable development of mining sector that is composed of following items;

A. Mineral-specific development strategies such as chromium, nickel, copper and others.
B. Action program on selected common issues in the mining industry such as legal framework, organization set-up, investment promotion, environmental protection and so on.
C. Design of GIS based database on mineral resources.

1.5 Albanian Counterpart

Directorate General of Natural Resources Development Policies (DGNRDP) of METE acted as a counterpart agency to the JICA study team and as a coordinating body to ensure smooth collaboration among relevant organizations of the Albanian counterpart and the JICA study team, and to monitor the progress of the study.

The DGNRDP will set up a working group of the study before commencing the study. The Working Group implement the Study in cooperation with the JICA study team and is fully associated with all phases of the study to ensure effective technology transfer.

The DGNRDP will conduct necessary arrangements with the private enterprises in order to conduct site investigations in their concession areas, if necessity arises

1.6 Steering Committee

To disseminate information and to ask cooperation for smooth and effective implementation of the Study, key persons of organizations relating mining activity are invited as members of the Steering Committee of the project.

Member of the steering committee of the study are as follows:

- Directorate General of Regulations (DGNRDP) of METE
- National Agency of Natural resources (AKBN)
- Albanian Geological Survey (AGS)
- Ministry of Environment, Forests and Water Administration (MEFWA)

1.7 Principle for Implementation of the Study

In this section, a basic approach for the establishment of a master plan set in "The Study for the Master Plan for Promoting the Mining Industry in Albania" is explained. In implementation of the study, to accomplish expected purpose of the study, a common view is built with the JICA study team and the Albanian counterpart following principle given below in this section.

The purpose of the study is to clarify a road map for realizing sustainable development of mining sector in the midst of the flow of the transition to market economies in Albania. The relationship of the Master Plan which is the output of the project and the roadmap which is expected to take shape following the results of this Study is shown in Figure 1.7.1.

In the study, the master plan, the action program and the roadmap are defined as follows.

Master Plan: A basic and comprehensive plan suggesting a direction to go further taking nation wide issues relating to mining sector into consideration.

Action Program: A plan for improvement of the sector showing procedures and order of necessary action.

Roadmap: A solid plan defining items necessary for implementation such as performance goal, critical points (restriction and difficulty which arise in the course of action) and countermeasures to overcome with priority, and the global image of the rough schedule with a time schedule.

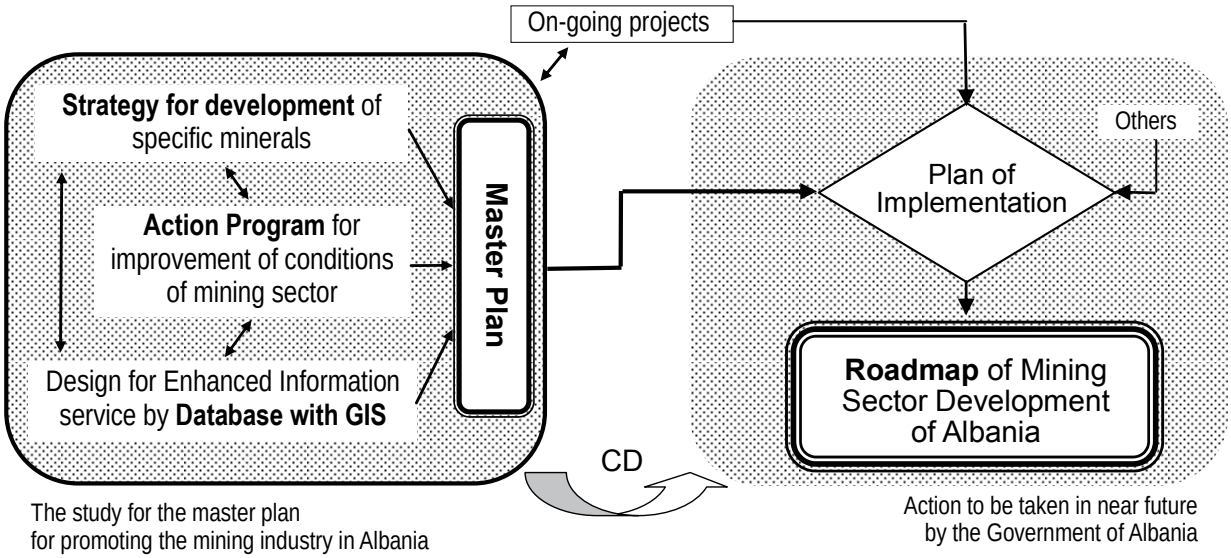


Figure 1.7.1 The relationship of the master plan and the roadmap

1.8 Background on Capacity Assessment and Development

The definition of Capacity Development is "the process by which individuals, organisations, institutions and societies develop 'abilities' (individually and collectively) to perform functions, solve problems, and set and achieve objectives;" (this is the UNDP / JICA definition). This definition also perceives the concept as three inter-connected layers of Capacity Development:

Level 1 - Individuals
Level 2 - Organisations
Level 3 - Institutions / society
(Source: Capacity Development Handbook for JICA Staff, March 2004)
http://www.jica.go.jp/english/publications/reports/study/capacity/200403/pdf/200403.pdf

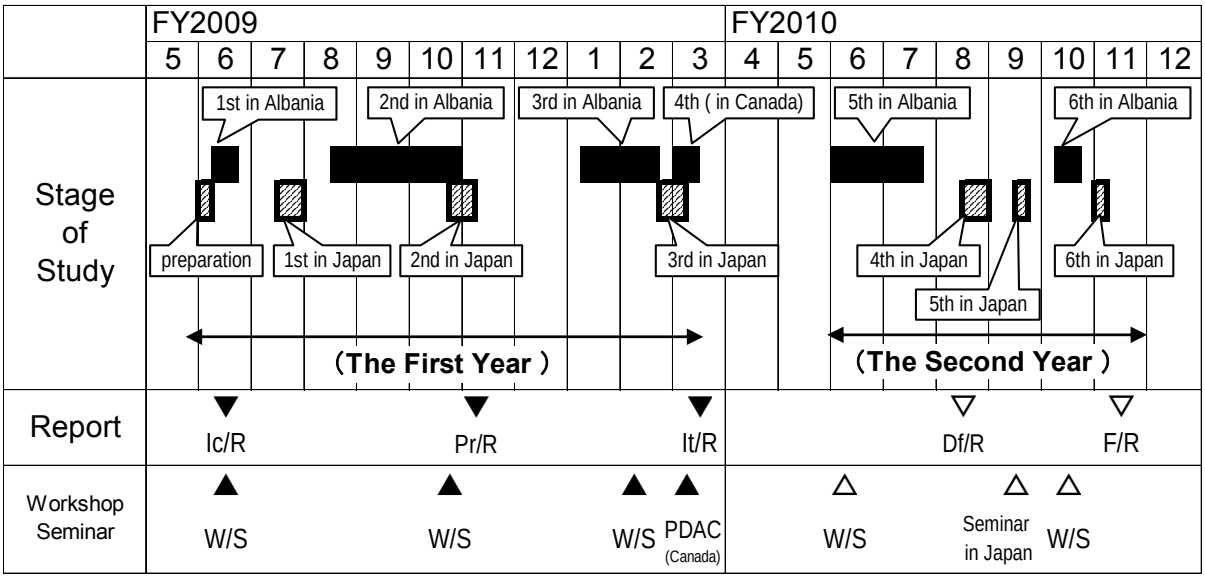
The main elements of Capacity Development with respect to these three levels, are provided in the table below.

Table 1.8.1 Main elements of Capacity Development with respect to these three levels

	Main elements of capacity development
Level -1 Individuals	Focus capacity development activities on developing knowledge and skills of individuals. The aim is to enable individuals to be able to achieve objectives using their own knowledge and skills.
Level -2 Organisations	Focus capacity development activities on strengthening the organisational framework / administrative structure so that an organisation can achieve its objectives. The capacity development activities therefore include support in assignment of roles and responsibilities and in the decision-making process, development of management systems, etc. The development of the organisational framework is achieved by focusing on the capacity of individual employees (Level 1), physical assets (computers, databases), organisational strategy and structure, management systems, leadership, human resource management, etc.
Level -3 Institutions/ society	Focus capacity development on developing the wider frameworks for the formation and implementation of policies, strategies, laws, etc; as well as facilitating communication and co-operation between relevant organisations.

1.9 Plan of the Study

General plan of the study is shown in the Figure1.9.1. The survey consisted of 2 years activities.



Ic/R : Inception Report, Pr/R : Progress Report, It/R : Interim Report, Df/R : Draft Final Report, F/R : Final Report

Figure 1.9.1 The whole process of the study

1.10 Progress of the Study

1.10.1 Preparation Work (May 2009)

In May 2009, Preparation Work was done in Japan. Details of the works are as follows:

- Collection and compilation of information, and preliminary analysis
- Discussion of basic policy of the Study in general, solid contents and the way of implementation
- Preparation for the 1st Study in Albania
- Preparation of the Inception Report

1.10.2 The 1st Study in Albania (June 2009)

During the 1st study in Albania, the first workshop is held for presentation and discussion of the Inception Report. After the approval of the Inception Report by steering committee, the actual work of the study starts from collecting and analyzing the information and data which are only available in Albania. Minutes of Meeting on the first steering committee is shown in Appendix 1.

A capacity assessment of related institutions and counterpart is conducted for planning the capacity development program, taking consideration of the need for the implementation of the Master Plan feasible to the counterpart.

Prior to formulation of GIS database, the study was carried out to understand present situation of hardware, software and already existing GIS database of AGS. Further, the accuracy and style of mineral resource data already collected by AGS are reviewed.

1.10.3 The 1st Work in Japan (July 2009)

In the 1st work in Japan, the work of understanding and analysis of the present situation based on the information and data collected during the first study in Albania is conducted for the following topics.

- position and role of mining sector in the national development plan (government policies of mining sector)
- government policy for mining
- environment of investment
- potentiality of mineral resources
- international competitiveness
- human resources development for mining sector
- aid activities related to mining of other donor
- infrastructure related to mining

1.10.4 The 2nd Study in Albania (From August to October, 2009)

The collection and analysis work carried out during the first study in Albania was continued in the 2nd study and the understanding of present situation on activities in Albanian mining industries and its analysis have been carried out. Furthermore, the understanding of present situation of mining industry of specific minerals has been executed as well as the study on an appropriate direction of action program.

In order to determine the strategy of development of mining by respective kind of minerals, i.e. chromium, nickel, copper and industrial materials which are the major mineral products in Albania, the collection of information and data on various items, such as reserves, mining methods, mineral dressing, smelting, infrastructure, organization/structure, economic competitiveness, and potential

state in future, was carried out, and also typical mines and facilities in smelters, etc. have were inspected.

As the information and data on mineral resources, such as ore reserves, etc., are being expressed in compliance with the standards of previous USSR (Union of Soviet Socialist Republics) in Albania, studies on the measures to evaluate those data and information in accordance with the International Standards currently being applied have been carried out. For the purpose to promote mutual understandings between counterparts and the JICA study team and capacity development of counterparts, a working group on the appropriate methods and procedures for estimating ore reserves was organized, and the overall meeting was held.

In addition, for the preparation of GIS data base, confirmation work on the hardware and software currently being used has been carried out continuously from the first study in Albania, and the state of the GIS data base being prepared was investigated. The present situation of utilizing GIS in Albania not only by governmental organization but also by private enterprises was studied. A working group was organized for studying and investigating issues for GIS data base being planned and prepared on the basis of understanding of present situation, and an overall meeting was held.

The second workshop was held and the present situation and issues of respective items collected and investigated at the second study in Albania were presented by Japanese delegation, and the final report from the World Bank and the new mining law were explained by the counterpart. Several discussions were made on these items presented. The program of workshop is attached in Appendix 2.

Upon the completion of the second study in Albania, the draft for progress report has been prepared in order to summarize the result of investigations done until that time.

1.10.5 The 2nd Work in Japan (From October to November, 2009)

In the 2nd work in Japan, the review and additions/correction work on the draft of progress report have been conducted.

1.10.6 The 3rd Study in Albania (From January to February, 2010)

The collection and analysis work of related information was continued in the 3rd study. On the basis of results from these analyses, the development strategies for respective kinds of minerals were clarified and a preliminary action program related to institutional, organizational and legal issues was discussed and prepared as well. Moreover, the basic concept of the GIS database was also discussed and determined. At the end of the study, the third workshop was held to have sufficient understandings of the study results between both parties of Japan and Albania. The draft for interim report was prepared in order to summarize the results until the 3rd study in Albania.

○Determination of development strategies for respective kinds of specific minerals

In order to propose the respective development strategy of specific minerals such as chromium, nickel, copper and non-metallic minerals, in order to achieve the efficient and consecutive development of mining sector, the following items were discussed in detail for respective kinds of minerals.

- type of ore and ore deposits, ore grade, scale of ore deposits
- distribution of ore deposits
- potential of new ore deposits to be found
- present state of dressing, smelting and refinery plants
- the method of ore treatment (i.e. dressing, smelting and refinery) being applied
- material flows and marketing

○Determination of basic plan on action program

The collection and analysis work of related information to institutional, organizational and legal issues of mining activities was continued in the third study successively from the second study in order to propose action program of common issues in the mining field, achieving the consecutive development of mining sector of Albania. As the result, for the sustainable development and strengthening of the mining sector in Albania, it is clarified that the strengthening of aspects related to all the main components of the institutional, organisational and legal framework is important. These main components were discussed in detail and each preliminary action program was proposed as a draft.

A working group meeting was held as many times as possible during the 3rd study by every respective themes such as action program, mineral-specific development strategies for respective kind of specific minerals, GIS database and environmental consideration. The third workshop was held to have sufficient discussions about the study results at the end of the study (Appendix 3).

1.10.7 The 3rd Work in Japan (From February to March, 2010)

During the 3rd work in Japan, the review and additions/correction work on the draft of interim report were executed.

A training course in Japan was carried out focusing on GIS technology and the strategy and administration of mineral resources database from 16th February to 26th February. The number of participants was 4 staffs from C/P organization.

1.10.8 The 4th Study in Canada (From March, 2010)

A presentation at the PDAC (Prospectors and Developers Association of Canada) international conference in Toronto, Canada was made by the study team to promote mining investment from foreign companies (refer to Attached Appendix 6). Counterparts from Albania also participated and examples of international best practices were discussed.

1.10.9 The 5th Study in Albania (From June to July, 2010)

In 5th study in Albania, three (3) times of working group meetings were held in order to prepare and to complete final drafts of the action program and the master plan.

As to the working group of development strategy for respective minerals, many discussions and reviews were carried out between key members of the group. During the period of this study, the workshop was held (please refer to Attached Annex 2 of Appendix 4), and the action programs (draft) prepared by respective working groups were presented and explained for collecting wide opinions.

Also, conceptual design work on the construction of GIS data base was carried out as well as carrying out the study for conceptual design on the website. The draft final report was prepared in accordance with these results.

○Preparation of Development Strategy for Respective Minerals

As to chromium, nickel, copper and non metallic minerals, the priority areas to be developed were selected in accordance with the basis of selection prepared and clarified with due consideration of possibilities on future increase of mineral resources and of the competitiveness in international markets. Also, the northern mineral deposit areas, where could not be inspected during the 2nd and the 3rd investigation and study periods, were inspected and the present state of developing mines and mineral exploration was assessed.

○Preparation of Action Program

The major twelve (12) elements in the relational frame work of organizations, regulations and laws in the mining industry sectors, which were identified and developed at the execution of 3rd field study in Albania, were discussed and reviewed by the working group. Discussions were made on the basis of this working group for the establishment of an action team which is a permanent organization responsible for carrying out the future action plan and/or policy.

1.10.10 The 4th Work in Japan (August, 2010)

During the 4th work carried out in Japan, the draft final report was prepared in accordance with the results obtained so far.

1.10.11 The 5th Work in Japan (September, 2010)

As the 5th work in Japan, a seminar on the investment to mining industries was held in Tokyo. Programmes of the seminar are as shown in Appendix 7.

1.10.12 The 6th Study in Albania (From September to October, 2010)

In the 6th study in Albania, presentations and explanations on the draft final report were carried out to relevant persons, and discussions were made between leaders, etc. of the respective working groups in order to complete the final report. Also, the result of study for this master plan was presented, and the workshop was held by the attendance with persons from the governmental organizations other than counterpart and private sectors as well as the counterpart in order to obtain various opinions on the same. Programmes of the workshop are shown in Annex 2 of Appendix 5.

1.10.13 The 6th Work in Japan (November, 2010)

During the 6th work carried out in Japan, the final report was completed in accordance with the result of discussions on the draft of the same carried out with the counterpart.

1.11 Issues and Tasks clarified during the Execution of Study

Issues and tasks found and clarified at the carrying out of study are as follows:

- According to the result of General Election held on June, 2009 in Albania, there were wide personnel changes in the organization of METE and related organizations under new minister. As these personnel changes occurred in October, 2009 after approximately four (4) months from the General Election, the time to discuss the key issues in detail with leaders of counterparts was insufficient during the second study. Furthermore, the time to discuss with leaders and managing staffs of the counterpart were restricted and limited during the period of carrying out 2nd to 5th field studies since the change in the government organization and personnel changes have been continuously made in Albania.

- Because the mining areas are located in the mountains, the conditions of access roads are generally not good in condition. Albania has many precipitations in winter, and therefore snow fall and/or freezing are likely occurred in mountain side and the site investigation of mining areas in winter season would be limited. Since the Albania has had a much amount of rainfall in this year, landslides and floods were occurred in the northern part

- The capacity assessment has shown that there are currently no engineers with the necessary wide experience in GIS technology AGS or AKBN, or elsewhere in METE and other counterpart organisations. At present, only about three (3) engineers have some experience and understanding in GIS in counterpart organisations. In particular, there is no GIS engineer in AKBN at the stage. For this reason, it is necessary for such engineers to be

educated and trained as soon as possible. Training elsewhere in METE is also needed to raise levels of understanding of the application of GIS.

- At the start of the project, there was not much progress in the sharing of information and data between ministries and/or governmental organisations, and such opportunities had not been positively create at this stage. This was one of the constraints to progress in the development of the mining sector. The working group meetings and workshops in this study have been opportunities to resolve such problem and have contributed to improve communication and cooperation.

- It should be noticed as a serious matter that sufficient mining specialists are not always available in the governmental organization, also especially less young staffs who have the knowledge of mining industries and expected to be management staffs in future.

1.12 List of Members participated in the Execution of Study

The members who are participated in carrying out of the study are as listed in Table 1.12.1 below:

Table 1.12.1 Members list for the execution of study

Name	Assignment or Organization
<JICA>	
Mr. Yoshiki EHARA	Assistant Director, JICA Headquarter
Mr. Ken YAMADA	Deputy Resident Representative, Balkan Office
Mr. Sokol KONOMI	Technical Coordinator in Albania
<JICA Study Team>	
Mr. Yoshiaki SHIBATA	Team leader / policy for promotion of mining sector
Mr. Minoru FUJITA	Policy for promotion of mining sector / development of human resources / promotion of investment
Mr. Masatsugu OKAZAKI	Strategy for development of minerals (Cr and others) / geology / statistical data on mineral resources
Mr. Ken NAKAYAMA	Strategy for development of minerals (Cu and Ni) / geology
Mr. Naotoshi NEMOTO	Strategy for development of minerals (processing)
Mr. Michael WENBORN	Institution / regulation / legal framework
Mr. Mikio KAJIMA	Management of environment
Mr. Zenichi CHIBA	GIS database
Mr. Hiroshi HYODO	GIS database / coordinator
Ms. Akiko OZAWA	Coordinator
<Albanian Study Team>	
Dr. Kristo RODI	Ministry of Economy, Trade and Energy
Mr. Dritan HYLLI	Ministry of Economy, Trade and Energy
Mr. Pjeter DEMA	Ministry of Economy, Trade and Energy
Mr. Sokol MATI	Ministry of Economy, Trade and Energy
Ms. Mimoza SIMIXHIU	Ministry of Economy, Trade and Energy
Mr. Zef LLESHI	Ministry of Economy, Trade and Energy
Mr. Ramiz BALLA	Ministry of Economy, Trade and Energy
Ms. Luljeta KRAJA	Ministry of Economy, Trade and Energy
Mr. Adil NEZIRAJ	Albanian Geological Survey
Ms. Musli DARDHA	Albanian Geological Survey
Mr. Gyovalin LEKA	Albanian Geological Survey
Ms. Edlira PLAKA	Albanian Geological Survey
Mr. Enkelejda GRAZHDANI	Albanian Geological Survey
Mr. Albert AVXHI	Albanian Geological Survey
Ms. Lavdie MOISIU	Albanian Geological Survey
Mr. Milo KUNESHKA	National Agency of Natural Resources (AKBN)
Mr. Taulant MUSAELLIU	National Agency of Natural Resources (AKBN)
Mr. Gjergj THOMAI	National Agency of Natural Resources (AKBN)
Mr. Edmond GOSKOLLI	National Agency of Natural Resources (AKBN)
Mr. Kleves JANKU	National Agency of Natural Resources (AKBN)
Mr. Adhurim CAUSHI	National Agency of Natural Resources (AKBN)
Mr. Ismail MEMA	National Agency of Natural Resources (AKBN)
Mr. Gole VASHA	National Agency of Natural Resources (AKBN)
Mr. Haki DISHA	National Agency of Natural Resources (AKBN)
Mr. Lama STOJA	National Agency of Natural Resources (AKBN)
Mr. Bardhyl SHUSHKU	National Agency of Natural Resources (AKBN)
Mr. David NACO	National Agency of Natural Resources (AKBN)
Mr. Ardit ISLAMI	National Agency of Natural Resources (AKBN)
Ms. Laureta DIBRA	Ministry of Environment, Forests and Water Administration
Ms. Blerta KERCUKU	Ministry of Environment, Forests and Water Administration

CHAPTER 2 FUNDAMENTALS FOR PROMOTING THE MINING INDUSTRY IN ALBANIA

2.1 National Economic Development Plan

There are a number of existing policies and strategies relevant to the mining sector in Albania. The development of the Master Plan for Promoting the Mining Industry of Albania has taken into account, and built on, these policies and strategies. The main policies and strategies that are relevant are:

- Programme of the Government of Albania (2005 to 2009).
- National Strategy for Development and Integration (2007 to 2013) (Government of Albania).
- Business and Investment Development Strategy 2007 to 2013 (METE) (2007).
- Strategy for the Development of the Mining Industry (METE) (2005).
- Updated National Environmental Action Plan (UNEAP) (2001)

The above programs and strategies are outlined in more detail in Chapter 3, (Sections 3.3.1). In addition, there are several donor programmes and projects that are relevant to the mining sector, in particular a project on mining sector reform, restructuring and future prospect by the World Bank in 2009 (Section 2.3.1), as well as the MCC Albania Threshold Program (Section 2.3.2). The development of the Master Plan has built on the core findings and recommendations from the World Bank and other programmes.

2.2 Economic Conditions

2.2.1 Macro Economy

The macroeconomic growth averaged around 6% from 2004 to 08. Inflation is low and stable with 3% inflation. Despite the recent global economic slowdown, Albania has been able to preserve a stable macroeconomic situation with growth for 2008 estimated to reach 6%, but declined to about 2% in 2009. The economy is bolstered by annual remittances from abroad representing about 15% of GDP, mostly from Albanians residing in Greece and Italy; this helps offset the towering trade deficit. The agricultural sector accounts for over half of employment but contributes only about one-fifth of GDP.

Macro Economic Indicators

	2007	2008	2009	note
GDP (purchasing power parity) US$	20.85	22.13	22.59	Billion US$, estimate
Annual GDP growth (%)	6.00	6.10	2.10	estimate
GDP per capita (PPP) US$	5,800	6,100	6,200	
Budget				Billion US$
Revenue	n.a.	n.a.	3.46	2009: estimate
Expenditure	n.a.	n.a.	4.10	

Source: CIA, USA

2.2.2 Industrial Sectors

GDP by industrial sectors at actual price (%)

	2002	2003	2004	2005*
Agriculture, hunting & forestry	23.4	23.5	22.3	20.7
Industry	6.9	8.6	10.0	9.7
-Extracting industry	0.7	0.6	0.8	0.8
-Manufacturing industry	6.1	8.0	9.2	8.9
Construction	12.0	13.7	13.9	14.3
Transport and communication	10.5	10.5	9.0	8.9
Trade, hotels and restraunts	23.8	22.1	21.6	22.4
Others services	23.2	23.2	23.2	24.0
(total, %)	*99.8*	*101.6*	*100.0*	*100.0*

Source: INSTAT Albania: Albania in Figures 2007, INSTAT, 2007

2.2.3 Mining Sector

Mineral production of Albania is summarized as below:

Table 2.2.1 Mineral production (average figure around 2008)

Mineral	Value Million US$	Number of Producers (including Small scale)	Per one unit (simple average) US$
Oil & gas	200～300	2	100,000,000～150,00,0,000
Metallic minerals	100	150～250	667,000～400,000
Non-metallic, lime stone	15～20	450	33,300～44,400
Total	315～420	600～700	* note

*note: As there are large scale operations of chromite and copper, the production value of small scale operations are much smaller than simple average number shown on this table. Situation is similar with non-metallic minerals operation.

Sources:
- Albania: Towards better governance in the extractive Industries – Transfer pricing and EITI, Presented by Z. Anton Melard de Feuardent, 15 February 2010, Tirana
- Final report, Governance partnership – Facility funded Study on small scale mining (SSM) in Albania: Improving Transparency, Accountability and Development Impacts, Chromite ores mining in the zone Batra-Bulqiza, Tirana, October 2009

2.3 Supported Projects of World Bank and International Donors

There are several international donor programmes and projects that have been carried out, or are currently being carried out, in Albania, which are relevant to the development of the mining sector. The most relevant project is a World Bank study completed earlier in 2009.

2.3.1 World Bank study on Mining Sector Reform, Restructuring and Future Prospects

The Government of Albania and the World Bank have recognised the high potential for economic growth in the mining sector in Albania. Therefore the World Bank has worked closely with the Ministry of Economy, Trade and Energy (METE) on the study on mining sector reform, restructuring and future prospects in Albania. The study was published in June 2009 and provides many proposed directions that are relevant to the Master Plan for promoting the mining industry in Albania.

The study report emphasises the need to improve the investment climate through reforming the policy, legal and regulatory frameworks, including enhanced administrative capacity and sector promotion. In addition, the report emphasises the need to improve the development outcome of the mineral operations through addressing environmental and social issues, as well as improving sustainability at the community level and benefit sharing.

The report suggests a comprehensive reform programme covering the following directions:

- Improving sector governance – with particular attention to improve coordination between the relevant institutions and organisations, as well as creating a transparent investment climate in order to improve attractiveness for international investors.
- Improving regulatory effectiveness – including contract enforcement on existing operations (i.e. ensuring that operations perform according to legal requirements and that they fulfil their contractual obligations).
- Strengthening the technical capacities of the relevant organisational institutions (e.g. METE and supporting agencies).
- Addressing environmental and social legacy, and community benefit sharing issues.
- Sustaining sector growth through sector promotion.

Source: Albania - Mining Sector Reform, Restructuring and Future Prospects (June 2009) - World Bank. Available at:
http://wwwwds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2009/07/21/000333037_20090721002237/Rendered/PDF/475390ESW0P1101C0Disclosed071171091.pdf

2.3.2 The Second Stage of the MCC Albania Threshold Program

The second stage of the Millennium Challenge Corporation (MCC) Albania Threshold Program is a two-year, $15.7 million agreement between Albania and the United States, funded by the MCC, and administered by the U.S. Agency for International Development (USAID), which aims to strengthen the rule of law, reduce corruption and increase public oversight, thereby improving the business environment in Albania through IT solutions and technical assistance.

The MCC Albania Threshold Program II builds upon the successes achieved during stage I of the MCC Albania Threshold Program, which included the establishment of the National Registration Center and the Procurement Advocate office, the enactment of the new tax procedure law, as well as the introduction of three major e-government services: e-registration, e-procurement, and e-filing.

The MCC Albania Threshold Program II supports reform in the following main areas:

- Administrative Court System: The program works to increase judicial capacity, reduce opportunities for corruption, and build investor confidence by supporting the planned administrative court system. Key initiatives include providing technical assistance, training, IT systems, and equipment to establish a Tirana-based administrative court.
- Tax Administration Reform: The program continues work to modernize tax administration based on the 2008 tax procedures law. Key initiatives include expanding e-filing and taxpayer services, establishing a Criminal Investigative Unit, strengthening the tax audit function, and establishing the Taxpayers Consultative Council.
- Business Licensing Reform: Following the successful model of the National Registration Center, the program supported the establishment and helps the operation of a ‘one stop shop’ - National Licensing Center that allows businesses to submit and track standardized business license applications electronically.
- Territorial Planning: Based on the new Law on Territorial Planning, approved in April 2009, the program works to establish a National Planning Registry that will streamline the

building planning process and reduce opportunities for corruption in building planning and permitting processes.

- Private Sector and Civil Society Engagement: The program supports non-profit and business associations to contribute in achieving MCCA2 (Program II) goals by assisting with policy changes, monitoring program-supported reforms, and advocating for improved anti-corruption measures. Efforts continue to educate businesses and the public regarding opportunities and services developed with the program's support.
- Anti-corruption Investigative Efforts: The program helps establish Special Investigative Units in prosecutor's offices in districts outside Tirana to strengthen efforts to combat corruption-related and economic crimes. This program component is implemented with assistance by the U.S. Department of Justice. http://www.mcata.org.al/

An opening ceremony of the National Licensing Center (NLC) headquarters in Tirana was held June 2009 with the participation of Prime Minister Sali Berisha and the USAID Mission Director.
All the above components of the MCC Program are helping to strengthen the framework for investment in the mining sector and other sectors.

2.4 Investment Climate

2.4.1 Foreign Direct Investment

Although FDI has increased over the last few years, it still remains among the lowest in the region with a large part of it coming from privatizations.
The EBRD (and World Bank) carry out much research into the business environment, and this provides a good summary that the Government has been making progress overall in facilitating investments and private sector participation, although there are still many areas that require improvement. The summary is cited as followings:

> The Government has made important progress in improving the business climate over the last years. In 2006 the Government launched the "Albania One Euro" initiative to attract FDI and announced construction of industrial zones and the sale of land and other state property at symbolic prices.
> In 2007/08 the government introduced a 10 per cent flat tax rate on personal and corporate income and implement a range of administrative reforms to increase tax revenues. The creation of a new business registration centre in 2007 reduced the time and cost required to open a business. As a consequence, the number of newly registered businesses increased by 34 per cent in 2008. New laws on concessions and on public procurement were adopted to approximate European standards. Bottlenecks in the bankruptcy process were addressed by introducing amendments to the bankruptcy law, although the law is largely untested. In June 2009, a one-stop-shop for licences and permits was opened, and legal amendments to reduce the time for issuing construction permits from 60 to 45 days were adopted. These improvements were reflected in the World Bank's Doing Business 2010 report, which ranks Albania 82nd out of 183 countries (up from 135th in 2008).
> However, weak law enforcement and high perceived levels of corruption remain important impediments to business development. Although the reported frequency of corruption in the courts and customs service has improved in recent years, firms still report above-average levels of corruption in the tax administration, according to the latest EBRD/World Bank Business Environment and Enterprise Performance Survey (BEEPS).
> The BEEPS results point to serious concerns amongst business managers in the area of land titling and ownership. Despite recent improvement in its Transparency International Corruption Perceptions Index (CPI) score, Albania still ranks 85th out of 180 countries, among the lowest in South East Europe and significantly below the OECD average.
> Source: EBRD Country Strategy for Albania (2009)
> http://www.ebrd.com/about/strategy/country/albania/albania.pdf

2.4.2 Openness to Foreign Investment

To increase FDI, the Government of Albania intensified its efforts to implement a number of fiscal and legislative reforms to improve the business climate. Those reforms, plus the signing of the Stabilization and Association Agreement with the EU in June 2006, and the invitation to join NATO, could help Albania improve its FDI significantly. 2007-2008 witnessed an increase in investor interest in a wide range of sectors, with energy generation, cement production, mining, oil and industrial parks heading the list.

The legal framework to encourage investment is already in place. Law 7764 "On Foreign Investment," dated November 2, 1994, was designed to create a favorable investment climate for foreign investors in the country. The law offers considerable guarantees to all foreigners (either physical persons or legal entities) willing to invest in Albania. Such provisions include:

- No prior government authorization is needed and no sector is closed to foreign investment.
- There is no limitation on the percentage share of foreign participation in companies - 100 % foreign ownership is possible.
- Foreign investment may not be expropriated or nationalized directly or indirectly, except for designated special cases, in the interest of public use and defined by law.
- Foreign investors have the right to expatriate all funds and contributions in kind of their investments.

There are limited exceptions to this liberal investment regime, most of which apply to broadcasting, health services and legal services. Restrictions on the purchase of real estate are relevant: agricultural land cannot be purchased by foreigners, but may be rented for up to 99 years; commercial property may be purchased, but only if the proposed investment is worth three times the price of the land. There are no restrictions on the purchase of private residential property.

Investors in Albania are entitled to judicial protection of legal rights related to their investments. Parties to a dispute may agree to arbitration. Foreign investors also have the right to submit disputes to an Albanian court. Provisions regarding domestic and international commercial arbitration are incorporated into the Albanian Code of Civil Procedure. As a practical matter, however, corruption remains a problem in the judicial system, and some foreign investors have experienced delays and losses as a result.

2.5 Information Centre in Tirana for Foreign Investors

Albania Business and Investment Agency (AlbInvest) under the METE is providing some information relating to investment in its website. Information provided by Albinvest is useful as a first contact point in Albania. In July 2010, AlbInvest was restructured as Albanian Investment Development Agency: AIDA.

At the time of October 2010, the Web site of Albinvest was providing such information as followings (updated in March 2008): Investment Climate, Basic Economic Indicators, Trade and Free Trade Agreements, Labour Costs and Regulations, Education, Skills and Labour Availability, Company Registration, Taxation, The Albanian Customs System, Property, Sites and Buildings, Transportation and Logistics, Utilities and Costs (Electricity, Water, Telecommunications, Internet Service), Useful Contacts (Last updated: February 2007)

CHAPTER 3 PRESENT SITUATION OF MINERAL RESOURCES MANAGEMENT IN ALBANIA

3.1 Modern History of Mining Sector of Albania

For understanding of the present situation, a brief history of the privatization of the mining sector of Albania is given below; based on "Sustainable development and systems for management of Mining Sector in Albania, NATO Science Series, IV Earth and Environment Science".

3.1.1 Mineral Production by State Enterprises in Centrally Planned Economy

The industrial exploitation of the solid minerals in Albania began before the Second World War in the form of concessions given mainly to Italian foreign companies. The mineral industry after the World War II was established as a State Enterprise based on the exclusive right of the State over the explored and unexplored mineral deposits and was developed on the basis of a total exploitation of the mineral resources ignoring the criteria of economic efficiency, protection of the environment, etc. To this end Albania was developed as an intensive mining country consisting of numerous mines and processing units of chrome, copper, coal, ferronickel, limestone, bitumen, tar sand and etc.

After 1991, the transitional period towards a market economy system caused a sharp decline of Albanian mineral production caused by:

- Gradual reduction of geological reserves of industrial importance.
- Transition period itself and the confrontation of the Albanian mining production with world market competition.
- Poor management at enterprising and ministerial levels.

3.1.2 Legislation of Mining Sector

Different legal actions were carried out starting from 1993 towards restructuring and privatization of mining industry. The latest legislation is Law no. 10304 of 15 July 2010 known as the New Mining Law. The most important ones are the following:

- The approval of the Mining Law of Albania No.7491, on 17 February 1994 accompanied later on with the respective Acts and Regulations for licenses and activities of prospecting, exploration and exploitation. *The latest amendment is the New Mining Law which was approved on 15 July 2010 as No. 10304.*
- Resolution of the Ministers' Council on 21 March 1994 on the approval of implementing Discount Cash Flow procedures Method for Evaluation of the Mining assets for the purpose of privatization of mining industry (approved by the Parliament as well).
- Law No. 8026, date 9 November 1995 "On the Privatization of the Commercial Societies, which operate in the Mining Sector".
- Law No. 8306, date 14 March 1998 for Privatization Strategy of particular strategic sectors (including mining sector).
- Council of Ministers Decision (VKM) No.421, date 09 July 1998 and the Order of Minister of Public Economy and Privatization No.9, dated 01 September 1998 "On the treatment of exploited mining deposits as well as of those mines which will be separated from the commercial societies and state enterprise" and the document of the General Directory of Mines NO.4631, Prot. Date 04 September 1998 Applying the Minister's Order No.9, date 01 September 1998.
- The law on the concession of the mining enterprise to foreign and local entrepreneurs 1998 – 1999.

- Law on Collateral approved recently to help banks and mining SME[*1] finance project.
- Law No.8761, date 02 April 2001 for Approval of concession agreement of "Build, Operation and Transfer: BOT" form between Minister of Public Economy and Privatization and Turkish Company "BER-ONER" for some Copper and Chromium Industry Objects and for the giving of some incentives and guaranties to concessionaire of this agreement.
- Law No.8791,date 10 May 2001 for Approval of concession agreement of "BOT[*2]" form between Minister of Public Economy and Privatization and Italian Company "DARFO" for Bulqiza Chromium mine, Bulqiza Chromium Dressing Plant, Klos Chromium Selection Plant and Burreli Ferrochromium Metallurgical Plan and for the giving of some incentives and guaranties' to concessionaire of this agreement.

3.1.3 Privatization of Mining Industry of Albania

1) General background

The first law on privatization was approved in August 1991. The law allowed a wide range of methods including auction, concession bids, direct sales, free distribution of shares, etc.

SMEs have been disposed of largely through employee buy-out or auction. Nearly all SMEs that had not been privatized during the early years of the process were sold or liquidated during 1997 and 1998. Many of them were economically not viable, hence they were liquidated and their assets were transferred to local authorities.

In March 1998, a more flexible regulatory framework for privatization was approved and in May 1998 a draft privatization plan was released, according to which a publicly owned business could be sold below book value, which, in many cases, did not reflect market values. This enabled the Government to divest the state share in joint ventures to private sector counterparts and private enterprises in strategic sectors.

The Government intends to privatize (at least partially) all main state monopolies, including transport, telecommunication, energy, mining and water. Since then, the Government has been looking for strategic investors for these sectors. The privatization method will be by international tender on a case-by-case basis. The cash received will be used to reduce the budget deficit.

Some of the bid companies included in the privatization list are:

- Telekomi Shqiptar – Albania's fixed network telephone operator.
- Albanian Mobile Communications (AMC) – The only mobile phone operator in the country (Already privatised).
- Korporata Energjetike Shqiptare (KESH) – The State electricity producer.
- Albpetrol – The state oil company, which currently has join venture agreements with several foreign oil companies.
- Albkromi – The state chrome mining company (completely privatized to DARFO, Italy and BER ONER, Turkish company).
- Albaker – The state copper mining company (already privatized in the form of concession to Turkish company BER ONER).
- Saving Bank of Albania – The second biggest bank in Albania, etc.
- National Commercial Bank of Albania – The second biggest second-tier bank in Albania (already privatized).

[*1] SME: Small Medium Enterprise
[*2] BOT: Build, Operate and Transfer

The lack of capacity for the State administration to successfully manage (in Albania as well as in any other country of the world) the mineral potential within only the public sector imposes the necessity to privatize the mining industry.

The efforts to rehabilitate the mineral industry started in 1993, resulting only in losing the majority of coal and ferronickel mines and some of the smaller copper mines.

2) Two main state mining enterprises

The Albanian State (Ministry of Public Economy and Privatization at that period) remained as the main owner of the former production mines and processing units in the chrome and copper industry, established in the form of ALBKROM, (State-owned shareholding chromium company) and ALBAKER (Albania copper corporation).

These two State companies, ALBKROM an ALBAKER proved to be non-effective production enterprises after 1990 and faced many problems linked mainly with the reduction of labor forces causing negative social phenomena, resulting from unemployment. The privatization process, proposed to be carried out in Albania beginning from June 1995, is completed in many other countries and is underway in some other countries of the Central and East Europe. Apart form the duration in time of the mining industry privatization process, it seems to be an irreversible process and a major trend, as it has produced positive results, where it has been implemented.

The end of the year 2000 marked the start of the revitalization of the chrome industry through the birth of many small chrome mines which brought the most skilled miners and engineers in the mining areas back to employment. But the process of mining growth in the Albanian chrome industry had been moving slowly because of the limited financial possibilities of the small chrome mines and the scarce information the Albania private banks have on the potential in chrome and other mining industries in Albania.

3) Privatization targets

Privatization targets in Albania were summarized as follows:

- Maximum attraction for the initial investments from potential local and foreign investors, without ignoring the continuation of the existing investments.
- The presence of big strategic mining companies of the existing investments.
- Increase in the stream revenues from private mining sector, in combined forms of taxation, royalties, custom duties, etc.

3.1.4 Post-privatization

Attention should be drawn also to the sustainability and environmental exploitation of mineral resources. That means, in order to ensure a normal running of the licensed private mining companies, the State (Government) will retain control of the following issues related to the private mining activity:

- Completion of the missing geological and other mining data.
- Follow-up of existing environmental regulations and the new ones to be updated.
- Harmonization of Albanian regulations with EU Mining Directives toward short term and long term compatibility.

An additional issue, accompanying the start-up of private mining companies, relates to the local authorities. Albania is a country where local authorities do not have the capacity to manage the development of natural resources, especially major and specific projects like those of mining, oil,

energy, water, etc. The co-operation between Institutions, the State (General Directorate of Mines) and consultants is of critical importance for the operation of private mining SME.

The division of the ALBKROM created a limited number of big chrome mines and numerous opportunities for private SME mining.

Generally there was not more than one application for each mine because the separated small mines were already exploited many years ago. But some of them represent interesting profitable mining opportunities for a SME mining. In such cases all applications are subjected to a tender / competition. Advantages are given to the companies represented by former mining staff. Anyway, the best decision as to whom to award the mining license should be taken in co-operation of the local authorities with the national authorities (Ministers) & national research centers and institutions.

Since there is no intense competition so far, the negotiations start once it was proved that the applying company has the capacity to run and finance the project. In case when more than one company apply for a mining concession or privatization, then a bidding procedure was organized under the supervision of the Ministry of Public Economy and Privatization.

Recent negotiations have finalized the copper industry Concession to BER ONER, while the Chromium Industry of Bulqiza Chromium mine (4 million tons of industrial reserves) and Burrell Fe-Cr smelter are transferred to DARFO. In the latter concession agreement, the areas of nickel deposits in the south-east of Albania were negotiated with the Australian company Adriatic Nickel.

Another issue of privatization is further unemployment in the first phase. The Trade Unions did not agree with it. That is why there must be found a specific strategy to negotiate with the leadership of Trade Unions in order to convince them that the privatization will not be stopped and that it is absolutely indispensable for its positive impact on economy.

The experience has shown that the Trade Unions may be the major and most complicated factor, which can stop the privatization process for some time, as it has happened in Germany and Romania recently. In any case, it is necessary to find a sustainable formula of privatization associated with social assistance to the unemployed working force. A special law was approved by the Government of Albania to the effect that miners will be paid from one to two years if they are made redundant during the privatization or mining closure procedures. Gradual growth of the private mining industry in the sector or chrome and construction materials had the positive impact on employment of the most skilled workers and engineers.

3.1.5 Establishment of Market – Economy - Oriented Policy

It is well known that the main source of the Albanian economy before 1990 had been the mining industry. The mining sector was an integrated activity starting from exploration, mining development, exploitation and mineral processing, smelting and refining, metal fabrication as domestic activity and export of minerals and metal products.

After the centrally planned economy had ceased, the mining sector reform started by transforming the state mining companies into private companies.

In November 2005, a comprehensive report was prepared under the title of "**Strategy for the Development of the Mining Industry** Based on the Regional Policies Designed for the Effective Management of the current Mineral Resources and those to be Discovered over a 15 year Long Pried". This comprehensive volume contains key topics of subordinate 3 volumes on Chromites, Copper and Nickel and Industrial minerals.

The mining strategy was, then, integrated into wider framework of national policy and a volume of the " **Business and Investment Development Strategy** (2007 - 2013)" prepared in February 2007,

Further, "National Strategy for Development and Integration: NSDI" was established in March 2008 aiming to be a member country of the EU. To attain this goal, a lot of existing legal framework of Albania should keep concordance with EU criteria, including mining legislation and policy. A progress report of this National Strategy for 2006 - 2007 was published in December of the same year.

At the end of September 2008 the World Bank held a workshop on "Challenges to Sustainable Mining Sector Development, Reform, Restructuring & Future Prospect". The JICA mission staying at Albania at that time attended this workshop.

The World Bank prepared a report titled as "Mining Sector Reform, Restructuring and Future Prospects", the direction expressed at the Workshop. This report is released on the World Bank Website as reporting No. 47539-AL in June 2009.

Foreign investment is expected to be a major driving force of mining development and materials introducing the investment climate have been prepared and released at the website of the Albanian Business and Investment Agency: Albinvest. The AlbInvest was reorganized as "Albanian Investment Development Agency: AIDA" in July 2010 to enforce its function.

To improve the licensing management, the "National Licensing Center: NLC" was established by the national law no. 10081 of February 2009. For mining activity, mining licensing is prerequisite. Therefore quick response and transparency in the process of granting license to applicants are of the most important interest for investors. Mining license information is to be integrated on the database of the National Registration Center (NRC) in future. More details are provided in Chapter 7 (Box 7.3).

Responding to those requirements, a draft of the new mining law has been prepared by The Ministry of Economy, Trade and Energy (METE) in 2009. This draft defines a mining strategy as well as the procedures of granting mining rights.

In the volume of "Business and Investment Development Strategy (2007 - 2013)", a specific chapter "DEVELOPMENT of THE MINING INDUSTRY" is prepared. This chapter contains such items as followings:

- Reform in the Past and Current Situation.
- Mining Sector Goals.
- Objectives are defined with time schedule (shown in the Table 3.3.1 - Table 3.3.5 of this report) .

3.2 Mining Administration

The Ministry of Economy, Trade and Energy (METE) is the most important ministry responsible for the mining in Albania. METE also consists of semi-independent Institutions that report directly to the Minister. These include the National Agency of Natural Resources (AKBN) and the Albanian Geological Survey (AGS), both of which are very relevant to the development of the mining sector, as well as the National Registration Centre: NRC, National Licensing Center: NLC, the Central Technical Inspectorate and the Mining Inspection and Rescue Unit. The dependent institutions report directly to the Minister.

In July 2010, METE's organization structure was revised. Before this organizational restructure, the General Directorate of Regulations and the General Directorate on Industrial Policies was a core general directorate. The function of the former General Directorate of Regulations was transferred to each industrial sector under relevant General Directorate.

3.2.1 Overview of Stakeholder Organizations relevant to the Mining Sector

This section provides an overview of the stakeholder organisations in Albania that are relevant to the mining sector. More details on the most important organisations are then provided in Section 3.2.2.

A range of types of organisations are relevant to the development of the mining industry in Albania, including:

- Institutional organisations responsible for the development and implementation of policy and legislation, including licensing.
- Regulatory institutions responsible for monitoring and enforcement of legislation.
- Regional and local municipal administrations responsible for the areas of Albania in which mining activities are being carried out or will potentially be carried out.
- Organisations responsible for promotion of investments and facilitating private sector participation (e.g. chamber of commerce).
- Private companies that work in mining and associated activities.
- Technical and research organisations.
- Non-government organisations (NGOs).
- International Finance Institutions (IFIs) and international donor organisations.

The relevant institutions and organisations under the above categories in Albania are listed below.

1) Overall institutional framework in Albania

There are several national ministries and departments relevant to development of the mining sector in Albania, responsible for development and implementation of policy and legislation. A list of relevant ministries is provided below.

Ministries and Departments relevant to the mining sector in Albania:

- Ministry of Economy, Trade and Energy (METE)
- National Agency of Natural Resources (AKBN)
- Albanian Geological Survey (AGS)
- Ministry of Environment, Forestry and Water Administration (MEFWA)
- Ministry of Finance (MOF)
- Ministry of Labour, Social Affairs and Equal Opportunities
- Ministry of Foreign Affairs
- Ministry of Health
- Ministry of Interior Affairs
- Ministry of European Integration
- Ministry of Justice
- Ministry of Public Works, Transportation and Telecommunications
- Ministry of Education and Sciences
- Ministry of Agriculture, Food and Consumers
- Department of Strategy and Donor Coordination (DSDC)
- General Department of Finance, Human Resources and Services

The typical organisational structure of Ministries involves a set of General Directorates, within which there are Directorates, within which there are Sectors, within which there are Offices, as illustrated in Figure 1 in Appendix 6. However it should be noted that these organisations are regularly restructured.

The High State Control is a high-level organisation in the Government of Albania that is responsible for the overall monitoring of the implementation of policy and legislation at a high-level. The more detailed auditing of financial aspects, and monitoring of technical aspects (e.g. health and safety,

environment, etc) is carried out by audit departments and inspectorate bodies within the relevant ministries.

2) Regional administration

There are 12 counties in Albania (called as Qark in Albanian language) for which there are regional administrations, including regional offices of certain ministries (Location Map of Albania shown in cover page). The 12 regions are:

Tirana	Lezjë	Elbasan	Vlora
Shkodra	Dibru	Kukës	Gjirokastra
Korça	Durrës	Fier	Berat

Within the counties, there are district / municipal administrations (so called local governments of 37 districts) responsible for local policy and municipal services.

3) Organisations responsible for promotion of investments and facilitating private sector participation

The core organisation responsible for promotion of investments in Albania is the Albania Business and Investment Agency (AlbInvest), which is a semi-independent institution within the Ministry of Economy, Trade and Energy (METE). This was reorganized as Albanian Investment Development Agency: AIDA to enhance its service in July 2010.

In addition, the Albanian Chamber of Commerce has a role in the promotion of private sector participation, including in the international arena. Its main activities relate to organisation of exhibitions and management of information on the private sector.

4) Private and state-owned companies that work in mining and associated activities

At the time of the adoption of the Business and Investment Development Strategy (2007 to 2013) of the Ministry of Economy, Trade and Energy in February 2007, about 470 companies and other organisations were operating in different areas of work across the mining sector in Albania. This included about 17 state-owned companies and institutions, including the Albanian Geological Service (AGS) and the National Agency of Natural Resources (AKBN), which are budget entities, and Sh.a. Albkrom and Ah.a. Albbaker, which are companies for mine rehabilitation. However, many of the state-owned companies have been winding up and stopping operations. At that time the number of employees in the mining industry was estimated to be about 6,000.

Source: Business and Investment Development Strategy (2007 to 2013) of the Ministry of Economy, Trade and Energy in February 2007
http://www.mete.gov.al/doc/20071218084802_business_and_investment_development_strategy.pdf

There had been three concession contracts with private companies before 2010 March and an additional tender of Kalimash area was closed at the beginning of March 2010. The concession contract was concluded with a local joint venture set by Chinese and Turkish companies. More details are provided in Chapter 7 (Box 7.2).

5) Technical and research organisations

Technical capacity is essential for mining sector development, for example technical capacity in surveys and exploration methods, chemical analysis, mining technology, processing technology, and other research and development. As well as the National Agency of Natural Resources (AKBN) and the Albanian Geological Survey (AGS), Tirana Polytechnic University (Faculty of Geology and

Minerals) has technical capacity, for example the Department of Geological Data, Applied Geology and the Environment.

In addition, the Institute of Geo-Sciences was set up in 2008 with the role of scientific research related to geological aspects.

3.2.2 METE and Important Organizations

1) Ministry of Economy, Trade and Energy (METE)

a. Overview

The Ministry of Economy, Trade and Energy (METE) is the main ministry responsible for the activities related to economic development in Albania, including development of industry sectors, particularly mining.

METE's objectives, published in 2009, cover the following:

- Privatisation activities.
- The improvement of the business climate and investments for sustainable development.
- Strategic programming.
- Industrial and energy policies for the mining and hydrocarbon sectors.
- Activities on trade liberalisation.
- Activities on regulatory and controlling mechanisms (licensing and concessions, market monitoring and consumer protection).
- Public property administration.

b. Organisational structure of METE

In July 2010, METE's organization structure was revised. After restructuring of July 2010, METE consists of 5 General Directorates, Inner Audit Department and (EU) Integration Department;

- General Directorate of Economic Development Policies
- General Directorate of Natural Resources Development Policies
- General Directorate of Trade Policies
- General Directorate of Projects & Economic Cooperation
- General Directorate of Supporting Services

In addition, the Ministry has several dependent institutions that report directly to the Minister. The most relevant institutions in METE related to the mining sector are:

- National Agency of Natural Resources (AKBN)
- Albanian Geological Survey (AGS)
- Division of Safety and Rescue of Mining Industry (DSRMI) or The Mining Inspection and Rescue Unit

Additional dependent institutions in the METE are:

- Central Technical Inspectorate
- National Registration Centre (NRC)
- National Licensing Centre (NLC)
- Concession Agency
- Accreditation Directorate
- Albania Business and Investment Agency (AlbInvest) / Albanian Investment Development Agency (AIDA after July 2010)
- Standardisation Directorate

- Directorate of Patents and Brands
- Directorate of Calibration and Metrology

More details on the roles of the individual directorates and institutions are provided below.

c. Roles of the Individual Directorates and Institutions in METE,

METE was restructured in 2006, before which the responsibility for monitoring was with a General Directorate on Mining (that no longer exists in the previous structure).
Through the latest structure revision of July 2010, the General Directorate of Regulations was dissolved into each policy sector set under each general directorate of sectors, namely, Economic Development Policies, Trade Policies and Natural Resources Development Policies.
Each Directorate was responsible for the collection and management of data for registers of organisations that have licences in the relevant sectors, but this role has shifted to the National Registration Centre (NRC). The organizational structure is illustrated in Figure 2A and 2B in Appendix 6.

Roles of METE's Directorates before restructuring

Before restructuring (up to July 2010) of METE, the Ministry had 4 General Directorates and an Inner Audit Department:

- General Directorate of Regulations
- General Directorate of Industrial Policies
- General Directorate of Trade Services
- General Directorate of Supporting Services

a) General Directorate of Regulations
The General Directorate of Regulations was particularly relevant to the mining sector in terms of licensing and contract management.
The mission of the General Directorate of Regulations was:
"The execution of the legislation in relation to licenses and concessions to private companies for activities related to minerals, hydrocarbons, energy and gambling, for the development of a sustainable economy and the stimulation of national and foreign business and investment; and the monitoring and contract management to ensure proper exploitation of natural resources".

- Development of legislation in relation to licensing and contract management, in co-operation with relevant institutional organisations.
- Monitoring, supervision and reporting activities in relation to the legislation and contract activities.
- Licensing activities and maintenance of databases on organisations with licences.
- Tendering and management of concession contracts.

b) Licensing and Contract Management Directorate (General Directorate of Regulations)
The Licensing and Contract Management Directorate in the General Directorate of Regulations was responsible for the implementation of legislation related to licensing and contract management in the sectors of minerals, hydrocarbons, energy and gambling, with the aim of stimulating national and international business and investment. The role included monitoring of the implementation of contracts between private organisations and the state in these sectors, in particular to ensure the proper exploitation of natural resources.

a) General Directorate of Economic Development Policies
The overall mission of the General Directorate of Economic Development Policies is to "create all the necessary conditions for the economic success of Albania." The General Directorate has about

40-50 technical employees. The General Directorate is responsible for coordination of policies and strategies related to the activities of METE.

b) General Directorate of Natural Resources Development Policies (GDNRDP)
The General Directorate of Natural Resources Development Policies (GDNRDP) includes directorate for Energy and directorate for Mining, namely Directorate of Energy and Directorate of Mining. The most important part of GDNRDP respect to mining is Directorate of Mining. It has 7 technical employees. There is one mining specialist working on areas related to mining policy. As well as development of policies and strategies on mining, other tasks included advice on agreements and contracts for concessions, privatisation activities, new development plans, as well as advice on legislation.

c) General Directorate of Trade Policies
The General Directorate of Trade Policies succeeded major tasks of former General Directorate of Trade Services, which included the following Directorates within its organisational structure: Strategic Relationships Directorate, Directorate on Industrial Park and Zone Development, Directorate on Public Property Administration, Privatisation Directorate.
Also, the FDI Sector has some relevance to the development of mining, and the Trade Policies Directorate has some responsibility related to alignment of legislation with EU Directives.

d) General Directorate of Projects & Economic Cooperation
The General Directorate of Projects & Economic Cooperation covers the aspects of economic co-operation, stimulation of small businesses.

e) General Directorate of Trade Policies
The General Directorate of Trade Policies succeeded major tasks of former General Directorate of Trade Services, which included the following Directorates within its organisational structure: Strategic Relationships Directorate, Directorate on Industrial Park and Zone Development, Directorate on Public Property Administration, Privatisation Directorate.
Also, the FDI Sector has some relevance to the development of mining, and the Trade Policies Directorate has some responsibility related to alignment of legislation with EU Directives.

e) General Directorate of Supporting Services
The General Directorate of Supporting Services included the following Directorates within its organisational structure: Legal Services Directorate, Internal Services Directorate.
Through the latest structure revision of July 2010, this General Directorate keeps almost same name and functions.

f) Internal Audit Department
Through the latest structure revision of July 2010, this Department keeps almost same name and functions. This department is responsible for the internal auditing and control in the Ministry of Economy, Trade and Energy.

g) Department of Integration
This department works as a coordinator between ministries for the integration with EU.

2) National Agency of Natural Resources (AKBN)

The National Agency of Natural Resources (AKBN) was established in August 2006 by the Decision No.547. It was previously called the Institute of Mineral Extracting and Processing Technology (ITNPM). Very recently, organizational revision is under discussion. The Vision, Mission and Objectives of AKBN are provided below at present.

a. Vision of AKBN

AKBN s is a public entity, which protects and administrates the interests of Albanian Government in the area of mining, hydrocarbons, hydropower and energy. Through this Agency, the creation of a developed, trade identifiable structure is intended, with international standards in all its activity areas.

b. Mission of AKBN

The Agency, as a subordinate institution under the Minister of Economy, Trade and Energy, advises government and provides studies and projects within its activity area, and it promotes the natural resources of the country.

c. Objectives of AKBN

- To make recommendations, consult, and cooperate with the relevant government structures for the development of policies in the area of mining, hydrocarbons, hydropower and energy.
- To implement government policies in the area of mining, hydrocarbons, hydropower and energy.
- To provide, within its scope, the government opinion on studies and projects in the area of mining, hydrocarbons and hydropower that have been presented by government or private entities, from country or abroad.
- To promote mineral and hydrocarbon resources, negotiate hydrocarbons or mining agreements and monitor the implementation of their development plans;
- To promote the renewable energy sources;
- To prepare the necessary documentation and procedures for issuing permits, licenses and authorization, as per the law, which will enable the signing of hydrocarbon agreements as per the signed agreements;
- To supervise mining, post-mining, hydrocarbon and hydropower activities;
- To monitor the execution of signed agreements on hydrocarbons;
- To monitor concessionary contracts on hydropower plants;
- To perform monitoring of exploited areas, mining risk and the interruption of mining activities;
- To manage exclusively all the primary data of hydrocarbon sector and the data related to the mining and post-mining activities;
- To compile and publish the annual energy balance-sheet at national and regional level.

The organisational structure of AKBN is shown in Appendix 6. The most relevant department to the mining sector is clearly the Mining Department, in Appendix 6 provides the organisational structure of the Mining Department in AKBN.

The Mining Department is the largest department in AKBN. As well as the Director, there are 33 technical specialists in the Mining Department including 5 specialists in the Directorate of Mining Promotion, 9 specialists in the Directorate of Supervision of Use (Exploitation and Projects). There are 18 specialists in the Directorate of Monitoring, which includes an analytical laboratory with equipment such as atomic absorption analysis.

3) Albanian Geological Survey (AGS)

The Albanian Geological Survey (AGS) is the technical and scientific advisory organisation to the Albanian State in the field of geology. It was established in July 1988 by Law No. 8366, which was updated in April 2004 by the Law No.9221.

At present the AGS particularly focuses on the mapping of various geological aspects in Albania, including different mineral resources, geological hazards, engineering geology, hydrogeology, etc. AGS is aiming to digitalise this mapping information. In addition, the organisation monitors in respect to groundwater and water sheds, coastal erosion, geo-environmental studies, etc. AGS has two analytical laboratories, carrying out chemical analysis and physical-mechanical analysis. The main shortfall in capacity reportedly relates to the need for new and improved equipment in the laboratories, and then the subsequent need for training in the new equipment. AGS currently has 134 employees, including the General Director, organised within the new structure shown in figure 4 in Appendix 6.

The main areas of work of the Albanian Geological Survey are:

- Estimation, managing and monitoring of underground waters in the main water bearing basins, with priority on tourist, urban areas, etc.
- Re-evaluation of natural resources and their use.
- Multidisciplinary studies on territory and natural resources management (Geology-Territory-Environment).
- Multidisciplinary studies of geo-environment and its monitoring.
- Evaluation of geological risk and specialized geo-engineering studies, in support of maintenance and enlargement of public infrastructure.
- Further development of information systems, databases, information exchange with decision makers and society (GIS).

4) Division of Safety and Rescue of Mining Industry (DSRMI)

Division of Safety and Rescue of Mining Industry (DSRMI) or The Mining Inspection and Rescue Unit is a semi-independent organisation within METE. It was established within the Law on Amendments of the Mining Law of Albania (2004) (No. 9261).

The responsibilities of the DSRMI includes the monitoring and enforcement of security and safety aspects of mining activity and to minimise safety risks during mining, and the responsibilities for emergency response in relation to mining.

The organisation has three directorates:

- Inspection Directorate
- Emergency and Rescue Directorate
- Internal Service and Administration Directorate

DSRMI also carries out these activities for processing plant related to mining.

5) Central Technical Inspectorate

The Central Technical Inspectorate is a national semi-independent state institution subordinated to METE. It was set up under Law No.9595 of 2006. The work of the Central Technical Inspectorate relates to inspection of activities in oil and gas, electrical equipment, and pressurised equipment. The Inspectorate has two laboratories.

6) National Registration Centre

The National Registration Centre (NRC), (QKR in Albanian language) was set up in May 2007 by Law No.9723 as a public institution under METE, which reports to the Minister. It was set up as part of the activities to improve the business climate in Albania and to reform the registration process for businesses in Albania. The aim of the Centre is to simplify, consolidate and manage the registration requirements for businesses in Albania and to reduce any barriers to business entry.

Source: Feedback from meetings with other counterparts and website of National Registration Centre: http://www.qkr.gov.al/nrc/default.aspx

7) National License Centre

The National Licensing Centre (NLC), (QKL in Albanian language) was set up in June 2009 as a public institution under METE, which reports to the Minister. It was set up as part of the activities to improve the business climate in Albania and to reform the licensing process for businesses in Albania. The aim of the Centre is to simplify, consolidate and manage the licensing requirements for businesses in Albania and to reduce any barriers to business entry.

8) Albania Business and Investment Agency (AlbInvest) / Albanian Investment Development Agency (AIDA)

The Albania Business and Investment Agency (AlbInvest) was restructured in 2006 and provides direct assistance to investors, in particular foreign direct investment (FDI), promotes small to medium sized enterprises in Albania, and provides assistance in relation to exports. The AlbInvest was reorganized as "Albanian Investment Development Agency: AIDA" in July 2010 to enforce its function.

The Albanian Government has assigned AlbInvest three strategic goals: assisting and accelerating the inflow of foreign investment into the Albanian economy, improving the competitiveness of Albanian exporters, and providing professional services to assist the growth of Albanian SMEs.

Example activities of AlbInvest include:

- Provision of up to date information on the investment climate, investment incentives, and the legal framework relating to the investment process in Albania.
- Assistance in cost benefits analysis.
- Identifying suitable site options and/or serviced office space.
- Assistance in obtaining the permits and licenses required by national and local authorities.
- Identifying potential suppliers in Albania.

9) Other institutions within METE

Other institutions within METE include:

- Accreditation Directorate
- Standardisation Directorate
- Directorate of Patents and Brands
- Directorate of Calibration and Metrology

3.2.3 Other relevant Ministries

1) Ministry of Environment, Forestry and Water Administration (MEFWA)

The role of the Ministry of Environment, Forests and Water Administration (MEFWA) is to draft and propose policies, strategies and action plans for the protection and administration of the environment, forests, waters and fisheries in order to achieve sustainable development, and to improve the quality of life and to enable the country to join the European Union.

The MEFWA's main tasks also include the development of national research programs in the environmental field, and, coordinating environmental protection-related activities of the other ministries and local authorities.

The directions in the program of the Ministry include:

- Development of legislation on environmental protection.
- Implementation of policy in line with the polluter pays principle, including enforcement of fines for pollution.
- Focusing on reduction of emissions to the atmosphere and polluted surface waters through adoption of environmental standards in line with EU Directives.
- Prioritisation of environmental hot spots, inherited by the outdated industries, and implementing neutralisation and rehabilitation of the areas.

- Taking measures to control against major erosion, for example by stopping extracting and exploiting activities in areas with a high risk of erosion.
- A focus on energy efficiency and the conservation of natural resources, and to increase the coverage of protected areas.

2) Ministry of Labour, Social Affairs and Equal Opportunities

The Labour Inspectorate in the Ministry of Labour, Social Affairs and Equal Opportunities is responsible for monitoring of health and safety management in the processing / smelting plant (but the Mining Inspection and Rescue Unit is responsible for the monitoring of health and safety in mines).
Source: meeting with METE

3.3 Mining Policy in Albania

Mining policy of Albania has been integrated with national development plan such as industry development strategy set on the wider prospect of whole national industrial sectors.

3.3.1 Programme of the Government of Albania (2005 to 2009)

The overall Programme of the Government of Albania provides the principles and plans of the government for the 5-year term of office. The plan is likely to be updated during the initial stages of the new term of Government (an election was held in Albania in June 2009). The core components of the Programme, which are relevant to the mining sector, are listed below.

Government Programme 2005 to 2009

The Government Programme (2005 to 2009) in Albania includes the following components, which are relevant to the development of the mining sector:

- Rapid and sustainable economic and human resource development
- Opening of trade, free and fair competition
- Attracting foreign investments
- Fiscal administration and policies
- Development priorities and budget expenditure
- Economic development and supporting policies
- Strengthening the institutional capacity and human resources for law enforcement
- Information and documentation system (including land and property registry)
- Transparency and Prevention of Corruption
- Developing infrastructure
- Environmental protection and the sustainable use of natural resources
- Reduction in unemployment
- Poverty reduction and social care
- European integration

Source: Government of Albania web site:
http://km.gov.al/?fq=preprog/programien#_Toc114360428

3.3.2 National Strategy for Development and Integration (2007 to 2013)

The National Strategy for Development and Integration (2007 to 2013) combines the principle agendas of the Government of Albania. As well as the overall goal of economic and social development, the National Strategy for Development and Integration (NSDI) includes integration into EU structures (including alignment with EU legislation), as well as the objective of achieving the Millennium Development Goals.

The NSDI has replaced the National Strategy for Socio-Economic Development (NSSED), which was the main strategic document of the Government of Albania until 2006.
Within the National Strategy for Development and Integration, the objectives for the mining industry are confirmed as:

- Assessing the mineral potential of the country.
- Ensuring that traditional and new minerals are effectively produced and promoted.
- Increasing the range of minerals produced.
- Ensuring that the minerals are fully and efficiently exploited.

Source: strategy available at web site: http://mie.gov.al/skedaret/1226905647-NSDI.pdf

3.3.3 Strategy for the Development of the Mining Industry based on the Regional Policies designed for the effective management of the current Mineral Resources and those to be discovered over 15 year long period (2005)

The Strategy for the Development of the Mining Industry was developed in 2005 by the National Agency of Natural Resources (AKBN) and the Albanian Geological Survey (AGS) on behalf of the Ministry of Economy, Trade and Energy (METE) under the title of "The Strategy for the Development of the Mining Industry based on the Regional Policies designed for the effective management of the current Mineral Resources and those to be discovered over 15 year long period".

The Strategy outlines goals and priorities for the sector, and covers wider aspects of the development of the mining sector, including legislation, licensing, concessions, and privatisation; as well as technical aspects and strategy for specific minerals.

The Strategy identifies particular priorities for the mining sector, including:

- Completion of the amendments and adoption of mining legislation, including amending the overall Mining Law and development of sub-legislation and regulations within the framework of the Mining Law.
- Implementation of policies to promote investment in existing mining activities and to promote and invest in widening the types of minerals to be exploited.
- Planning and completing the closure of inefficient mines, including identification of the environmental and other risks, and implementation of monitoring programmes to measure parameters related to these risks.
- Promoting the use of high standards of technologies in the mining sector to ensure continuous development of the industry.
- Setting the framework for private sector participation in the mining sector.

The Strategy has considerable detail on some aspects of the framework for development of the mining sector. However, the implementation of the Strategy would be facilitated by a precise action plan containing realistic actions with clear roles and responsibilities, and with specific timescales.

Source: Strategy provided by General Directorate on Policies of METE

3.3.4 Business and Investment Development Strategy (2007 to 2013)

The Business and Investment Development Strategy is the core strategy relevant to the Ministry of Economy, Trade and Energy, covering a range of sectors but particularly the mining sector. The strategy covers 2007 to 2013 and its mission is:

"To guide the Government policy toward the steady growth and dynamic development of Albanian business entrepreneurship, productivity and competitiveness, investment promotion and orientation, and better use of financial and natural resources".

The core principles and directions include:

- Improvement of the business climate by establishing regulatory and institutional mechanisms to streamline the business registration and licensing process.
- Implementing measures to reduce the informal economy and ensure fair market competition.
- Longer-term focus on education and training of human resources in order to facilitate business productivity and competitiveness.
- To improve co-ordination of policies for the promotion of SME, exports and foreign direct investments (FDI), and encourage partnerships between FDI and SMEs.
- The promotion of technology transfer and innovation, research and development, and partnership with universities and academic resources.

The strategy recognises that aligning the legal framework of the Albanian mining sector with EU legislation will be a major challenge in terms of affordability and capacity, in particular related to environmental standards and labour standards. In order to attract investment, the strategy recognises the need to reduce the financial liabilities on mining companies related achieving these EU standards.

In addition the strategy recognises the institutional, administrative and technical challenges in the mining sector, and other points on the mining sector in the Business and Investment Development Strategy (2007 to 2013) include:

- In relation to the demand for raw mineral materials, the strategy recognises the need to programme geological research in the longer-term in order to establish a map of mineral areas.
- In addition, to help the mining sector in Albania to cope with the fluctuation in prices in the international market, the strategy proposes an increase in capacity of mineral processing in Albania.
- The strategy also proposes measures to increase the competition in the market within the mining sector.
- Also, the strategy recognises the problems with land ownership right issues need to be addressed.
- Capacity development of human resources will be needed, for example so that engineers, economists, managers can carry out technical and economic analysis, environmental impact assessments (EIAs), etc.
- As well as improvements in environmental management and rehabilitation activities, improving safety of workers is required according to the strategy.

The Business and Investment Development Strategy (2007-2013) has 5 strategy objectives related to mining (Table 3.3.1 – 3.3.5):

- Objective 1 – to approximate legislation in response to EU integration and mining activity development.
- Objective 2 – to ensure institutional strengthening and human resources professional development in response to increasing demand by the restructures mining industry in the context of sustainable development.
- Objective 3 –to formulate and implement general policies for the promotion and rational use of natural resources and increasing mining reserves.
- Objective 4 – to implement effective control and supervision of mining activities at extraction and processing entities.
- Objective 5 – to continuously monitor post mining activities and ensure that mining activities respect the environment and the communities.

The Strategy provides cost estimates for its implementation, including costs in the mining sector from 2007 to 2013.

In addition, the Strategy includes a broad action plan for achieving the above objectives in an Annex.
Source: strategy available at web site:
http://www.mete.gov.al/doc/20071218084802_business_and_investment_development_strategy.pdf

3.3.5 The 5 Strategy Objectives in "Business and Investment Development Strategy (2007-2013)" and its Achievement

The Business and Investment Development Strategy (2007-2013) has set 5 strategy objectives related to mining. A review of the achievement of these plans was done in July 2010 at the working group. The results are shown in Table 3.3.1 – 3.3.5.

Linkages between the New Mining Law, Mining Strategy and Business and Investment Strategy

- The mining strategy: Strategy for the Development of the Mining Industry based on the Regional Policies designed for the effective management of the current mineral resources and those to be discovered over a 15-year period was developed by METE in 2005. It was then combined with other strategies relevant to METE (e.g. strategies on hydrocarbons, electricity) into the overall Business and Investment Development Strategy 2007 to 2013, which was developed by METE (February 2007).
- Both the Mining Strategy (2005) and the Business and Investment Strategy (2007) have been approved and adopted by government. The Business and Investment Strategy (2007) is the over-arching document that is mainly used, but the more detailed Mining Strategy (2005) still applies.
- The priority of the documents to the METE is demonstrated as the Business and Investment Strategy (2007) is on the METE web site, but the Mining Strategy (2005) is not on the web site.

Source: Meeting with General Directorate of Policies, METE

Table 3.3.1 Objective 1 in the Business and Investment Development Strategy (2007-2013)

Objective 1
Approximate legislation in response to EU integration and mining activity development (ANNEX IV p.70)

Activity	Target	Indicators	Timeframe		Impact	Involved institutions
			Start	End		
1.1 Approximation of the mining law with EU directives	Legislation approximation and improvement	Amended Albania Law	Mar-07	Oct-08	Concordance with EU directives on mining Expedited licensing process Avoided legal duplication and overlapping of management instructions' responsibilities Certification of the Government role in the mining activiy and mining law	Parliamemt, Council of Ministers METE,, Mining Institutions, Ministry of Integration
1.2 CoMD implementation legislation and regulations on:						
1.2.1 Mining supervision and inspection	Legislation approximation and improvement	Regulations on mining supervision	Oct-06	Jun-07	Rational exploitation of mining resoruces, Good management of the national non-renewable resources	Council of Ministers, METE, Mining institutions, Ministry of Environment, Mining Universities, Ministry of Interior and Local Government
1.2.2 Mining monitoring		Regulation on mining monitoring	May-07	Jun-07	Inspection of mining risks;	
1.2.3 Certification of mining products		CoMD on the certification of mining products	Jan-08	Sep-08	Inspection of mining products;	
1.2.4 Closing of mines that have been or are in operation		CoMD on closing mines	Jan-07	Apr-07	Rehabilitaion of premises in used or closed mines;	
1.2.5 Licensing (privatization and liberalization) of research, consultancy and technical management services in the mining sector		Regulation on research, technnical design, consultancy and technical management service in the mining sector	Sep-06	Dec-06	Possibility of increasing mining study-design-execution activity	
1.2.6 Standardization as per EU directive					Concordance of mning legislation with EU directives on mining	
(1) Normal working conditions, health safety of empyees		CoMD on working conditions in mines safety	May-07	Nov-08		
(2) Mining discharges and waste		CoMD on mining discharges and waste	May-07	Dec-08		

Note: CoMD: Decision of cabinet meeting

Objective 1
Approximate legislation in response to EU integration and mining activity development

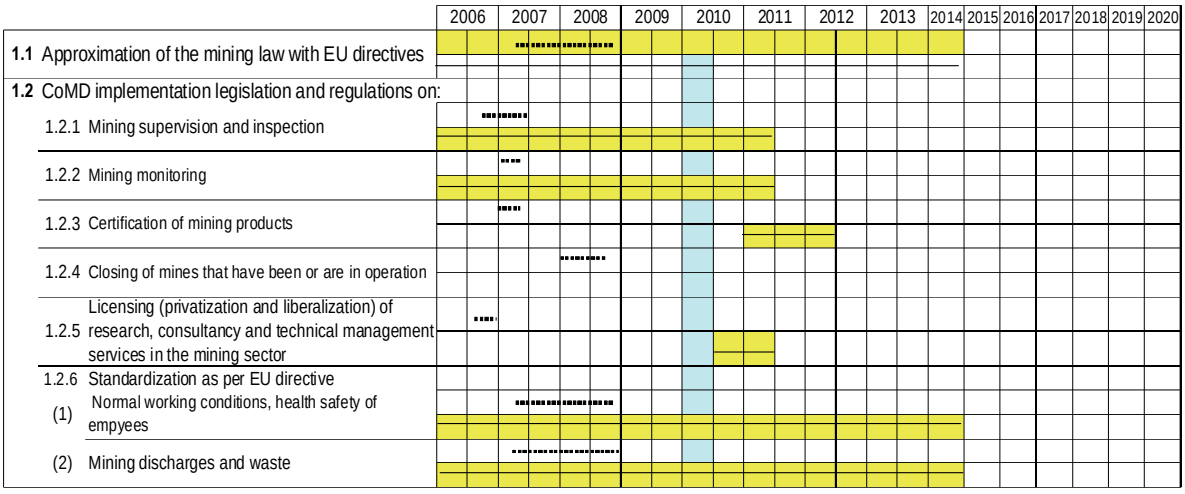


Table 3.3.2 Objective 2 in the Business and Investment Development Strategy (2007-2013)

Objective 2
Ensure institutional strengthening and human resources professional growth in response to increasing demand by the restructured miming industry in the context of sustainable development (ANNEX IV p.71 - 72)

Activity	Target	Indicators	Timeframe Start	Timeframe End	Impact	Involved institutions
2.1 Completion of the restructuring of mining institutions;	Improve effectrivenss Professional work of institutions invovee in mining	Establishment of the National Agency for Natural Resoruces	Jan-06	Jun-06	Effective management of human reources	Coucil of Ministers METE
2.2 Vocation training of administrative structures;		Staff training in the country and abroad	Jan-07	Dec-07	Reassessment of mining resources	
		Participation in post-university courses	Sep-06	Sep-09	Icreased professinal levl of staffs in mining institutions	
2.3 Increase of the logistic capacity of mining institutions:		Improvement of field laboratories for supervising and monitoring mines	Jan-07	Dec-08	Improved and modernized logistical capacity of mining institutions	
2.4 Cooperation among institutions in the country and abroad						Mining and geology institutions Mining universities
2.4.1 Organization of a mining workshop every		Organization of a mining workshop every year	Dec-06	Dec-20	Fulfilled role of Government services	
2.4.2 Participation in cooperation areas with institutions from EU members' states		Participation in cooperation areas with institution from EU member states	Sep-06	Dec-20	Cooperation and exchande of experience	
2.5 Mobilization of human resources those are professionally capable in the area of minerals and energy		Provision of the National Agency for Natural Resources with skilled staff	Sep-06	Dec-20	Involvement of slilled human resources	

Objective 2
Ensure institutional strengthening and human resources professional growth in response to increasing demand by the restructured miming industry in the context of sustainable development

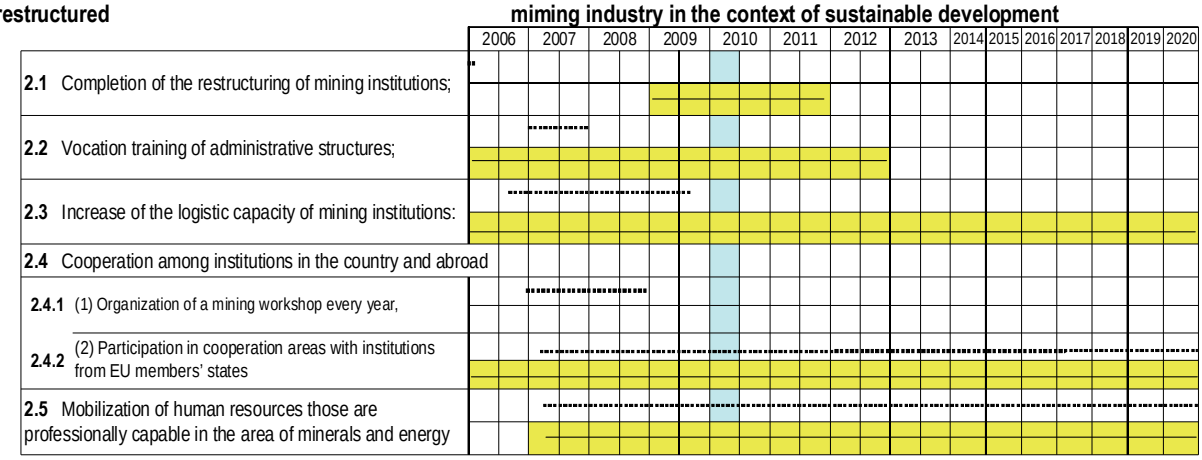


Table 3.3.3 Objective 3 in the Business and Investment Development Strategy (2007-2013)

Objective 3
Formulate and implement general policies for the promotion and rational use of natural resources and increasing mining reserves (ANNEX IV p.72 - 73)

Activity	Target	Indicators	Timeframe		Impact	Involved institutions
			Start	End		
3.1 Development of;	Attraction of investments in the mining sector, increased employment in the mining sector, development of rural areas					METE, Mining and geology instituteions, Ministry of Transport, Ministry of Environment, Ministry of Intrior and Local Government, Ministry of Agriculture Food and Consumer Protection, Ministry of Defense, Investment Promotin Agency, Statistics Institute, Chamber of Commerce
3.1.1 Mineral promotion strategy		CoMD	Jan-06	Dec-06	Define main areas in the process or promotion;	
3.1.2 Recognized mining areas promotional and promotional models for mining areas to be explored;		Mining Promotion Strategy regulations	Jan-07	Jun-08	Rational exploitation of mining resources;	
3.1.3 specific strategies for mineral market;		Specific mineral strategies			Exploitation of new minerals and processed mineral products;	
3.1.4 Six-monthly newsletters on mineral market.		Annual publication of promotional models and infromational brochures on mining	Dec206	Dec-20	Information about mining	
3.2 Development of maps:					Completion of the database with data on mining licenses and computerization of the database;	
3.2.1 Mining areas (preparation and updating);		Map of mining area			classification according to internationally recognized	
3.2.2 Depth metallogenic (publication every other year)		Map of metallogenic depth	Jan-07	Dec2008(updating by2020)	Complex information about metallogenic depth as a basis for exploration activities	
3.2.3 Spatial planning (preparation and updating)		Map of spacial planning	Jan-07	2012(updating by 2020)		
3.2.4 Digital map of mining facilities		Digital map of mining facilities	Jan-07	Dec-09		
3.3 Establishment of a National Mining Registry		National Mining Registry	Jan-07	Dec2008(updating by 2020)		
3.4 Complex studies on;						
3.4.1 Ont specific mining regions on exploration and modern processing ttechnologies		Complex studies on specific mining regiones on extending mining resources	Jan-07	Dec2009(updating by 2020)		
3.4.2 On the mining market (supply and demand, and needs) in the country and the region						
3.5 Assessment of the deficit minerals in the European market and our capacities of production them			Jun-06	Dec-20	Assessment of the current situation and prospects in mining and mineral market in the country and abroad;	
3.6 Participation in the information network (media, internet, press, publication)		Website of the AKBN	Jan-07	Updating by 2020		

Objective 3
Formulate and implement general policies for the promotion and rational use of natural resources and increasing mining

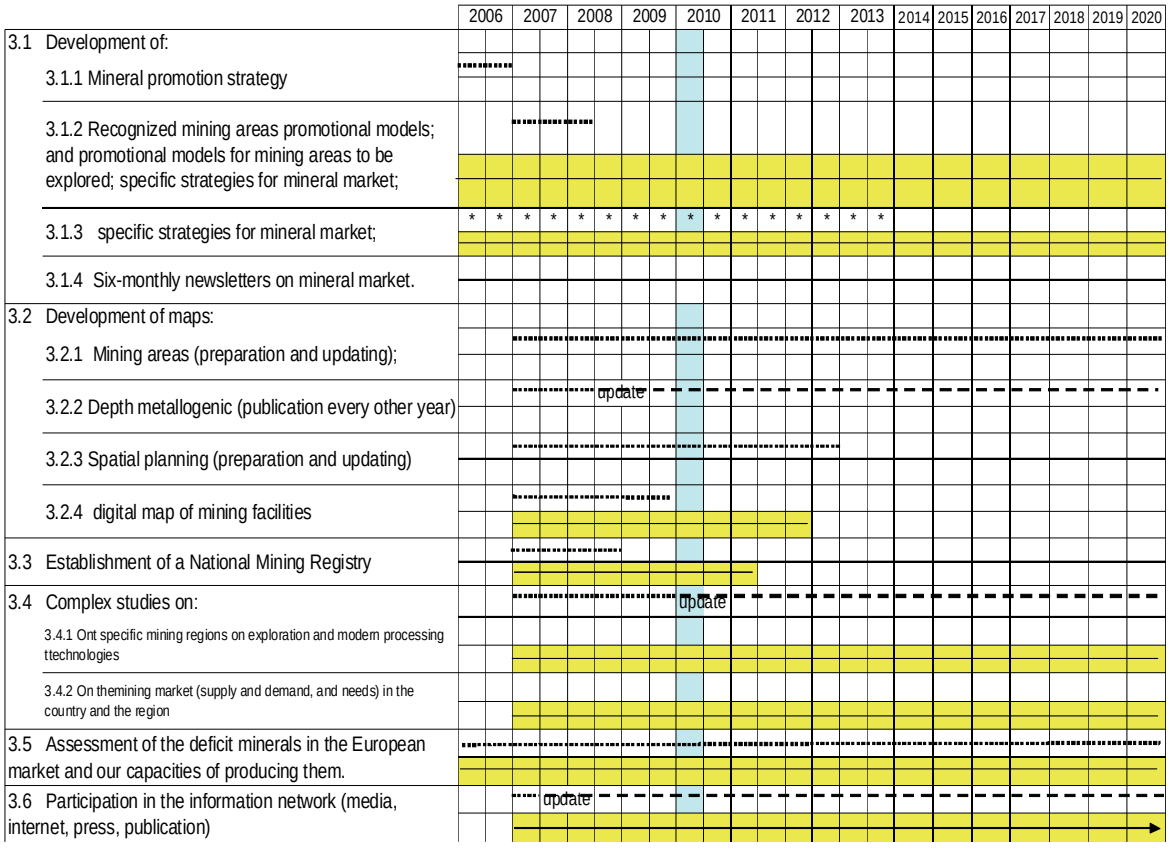


Table 3.3.4 Objective 4 in the Business and Investment Development Strategy (2007-2013)

Objective 4
Implement effective control and supervision of mining activities at extraction and processing entities (ANNEX IV p.73 - 74)

	Activity	Target	Indicators	Timeframe		Impact	Involved institutions
				Start	End		
4.1	Performance of a continuous inspection and supervision of mining entities as per mining legislation requirements	Good management of natural mining resources	Performed control as per mnining legislation requirements	Jul-06	Dec-20	Techinical review of aplicaiton for mining right; Verfication of mining areas, Inspection as per mining legistlation requirements, Financial audits of exploited amounts ensureing transparency of mining businesses; Monitoring of exploitation of reserves as per approved programs; Monitorign of the implementation of working safety relues; Monitoring of professional level and treatment of employees;	METE, Mining institutions, Ministry of Environment, Ministry of Interior and Local Government
4.2	Performance of technical control and review of applicants for mining rights	Rational exploitation of mining resources;	Technical review of applications for mining rights	Jul-06	Dec-20		

Objective 4
Implement effective control and supervision of mining activities at extraction and processing entities

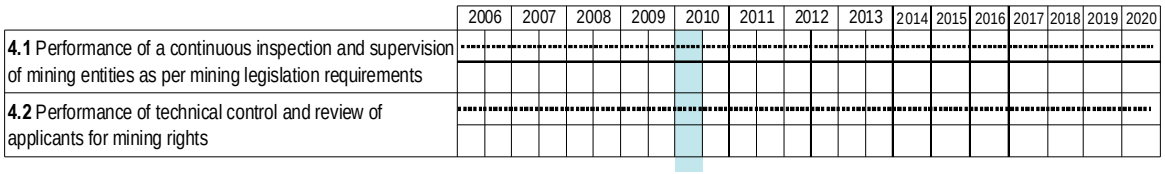
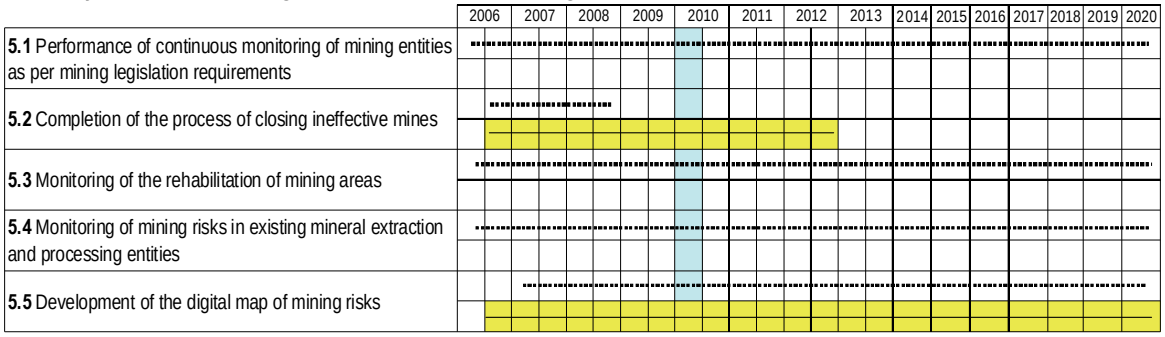


Table 3.3.5 Objective 5 in the Business and Investment Development Strategy (2007-2013)

Objective 5
Continuously monitor post mining activities. Ensure that mining activities respect the environment and the communities (ANNEX IV p.74)

	Activity	Target	Indicators	Timeframe		Impact	Involved institutions
				Start	End		
5.1	Performance of continuous monitoring of mining entities as per mining legislation requirements	Protect mining areas and surrounding environment, and avoid ining disasters	Continuous monitoring of mining areas	Jul-06	Dec-20	Monitoring of mining areas as per legal requirements Monitoring of mining and post-mining activities, Monitoring of mining risks; Monitoring of damage caused by mining activities; Completion of the process of closieng ineffective mines; Establishment of action options in dase of emergencies	METE, Mining and geology institutions, Ministry of Environment, Ministry of Interior and Local Governed, Ministry of Agriculture, Food and Consumer Protection, Ministry of Defense
5.2	Completion of the process of closing ineffective mines		Implementation of projects for closing mines	Sep-06	Dec-08		
5.3	Monitoring of the rehabilitation of mining areas			Sep-06	Dec-08		
5.4	Monitoring of mining risks in existing mineral extraction and processing entities			Sep-06	Dec-08		
5.5	Development of the digital map of mining risks		Map of Albania mining risks	Jun-07	Dec-10		

Objective 5
Continuously monitor post mining activities. Ensure that mining activities respect the environment and the communities



3.3.6 National Environment Action Plan

The National Environment Action Plan of 1994 was updated in 2001. The main objective of the Updated National Environmental Action Plan (UNEAP) (2001) is to provide the basis for ensuring an integrated form of environmental management that optimises the utilisation of natural resources taking into account environmental and economic sustainability. It aims at making environmental management more effective by improving the institutional capacities, mitigating and preventing environmental problems, strengthening the basis for the utilization of natural resources in conformity with the principle of sustainable development, promoting economic growth and reducing poverty.

The Updated National Environmental Action Plan (2001) included plans for the improvement of the legal framework including a plan on the amendment of the law on taxation and other laws that provide for financial instruments and the introduction of taxes for the environmental rehabilitation of mining areas. The Plan recognises the need for a clear definition of legal responsibilities regarding the clean-up of the existing contaminated sites related to the mining sector.

Source: Updated National Environmental Action Plan (2001)

3.4 Overview of Main Legislation relevant to Mining Sector

As well as legislation specific to mining activities, there are several other areas of legislation relevant to development of the mining sector, including laws on foreign investment, laws related to private sector participation, laws on environmental protection, laws on health and safety, etc.

3.4.1 Legislation specific to Mining Activities

The Mining Law of Albania (1994) was amended in 2004 and 2007 through the following legislation:

- *Law on some Supplements and Amendments of the Mining Law of Albania (2004) (No. 9261).* This Law included provisions for the set up of DSRMI as a semi-independent organisation within the Ministry of Economy, Trade and Energy (METE).
- *Law No. 9667 amending and supplementing Law No. 7796 of 1994 on the mineral resources of Albania (2006).* This Law lays down various amendments and addenda to Law No. 7796 of 1994 on the mineral resources of Albania. Firstly, it defines "post-mineral monitoring" as a process for monitoring and controlling certain parameters and also for assessing the impact of mining activities after mines have been exploited. The amendments also define the status of AKBN as a specialized entity that provides technical assistance to the Ministry.

As well as the two laws in 2004 and 2006 to amend the Mining Law of Albania (2004), there are four associated regulations:

- Instruction No. 5, data 08.01.2007
  "About the content of documentation for Exploitation Mineral Licence Renovation".
- Instruction No. 5/1, data 05.02.2007
  "For content of documentation for Mineral Licence supply".
- Instruction No. 5/2, data 05.02.2007
  "About monitoring of request investigation process, for Mining Licence"
- Instruction No. 5/3, data 05.02.2007
  "About of documentation content for Mining Licence Transfer"

After re-drafting in early 2010 to take into account improvements needed to clarify certain aspects, such as new licensing arrangements, tendering, more detail on EITI, environmental protection, and more on the role of Local Authorities, as well as clarification on the rights of mining companies, the

Draft New Mining Law was finally approved at the Albanian Parliament on 15 July 2010 as law No.10304. Secondary legislation is currently under development.

3.4.2 Law on Foreign Investment

In Albania, the legal framework to encourage foreign investment is already in place through Law 7764 "on Foreign Investment" (1994). This law is designed to create a favourable investment climate for foreign investors in the country, aiming to offer guarantees to all foreigners (either physical persons or legal entities) willing to invest in Albania. Such provisions include that no prior government authorisation is needed and no sector is closed to foreign investment, and there is no limitation on the percentage share of foreign participation in companies (100% foreign ownership is possible).

3.4.3 Legislation related to restructuring the Mining Sector to Facilitate Privatisation

Different legal actions have been carried out from 1993 to focus on restructuring and privatisation of mining industry. The most relevant ones include:

- The approval of the Mining Law of Albania No.7491, on 17 February 1994 accompanied later on with the respective Acts and Regulations for licenses and activities of prospecting, exploration and exploitation.
- Resolution of the Ministers' Council on 21 March 1994 on the approval of implementing Discount Cash Flow procedures Method for Evaluation of the Mining assets for the purpose of privatisation.
- Law No. 8026, date 9 November 1995 "On the Privatisation of the Commercial Societies, which operate in the Mining Sector".
- Law No. 8306, date 14 March 1998 for Privatisation Strategy of particular strategic sectors (including mining sector).
- Council of Ministers Decision (VKM) No.421, date 09 July 1998 and the Order of Minister of Public Economy and Privatization No.9, dated 01 September 1998 "On the treatment of exploited mining deposits as well as of those mines which will be separated from the commercial societies and state enterprise."
- The law on the concession of the mining enterprise to foreign and local entrepreneurs (1998 – 1999).
- Law on Collateral approved recently to help banks and mining small to medium enterprise (SME) finance project.
- Law No.8761, date 02 April 2001 for Approval of concession agreement of "Build, Operation and Transfer: BOT" form between Minister of Public Economy and Privatization and Turkish Company "BER-ONER" for some Copper and Chromium Industry Objects and for the giving of some incentives and guaranties to concessionaire of this agreement.
- Law No.8791,date 10 May 2001 for Approval of concession agreement of "BOT" form between Minister of Public Economy and Privatization and Italian Company "DARFO" for Bulqiza Chromium mine, Bulqiza Chromium Dressing Plant, Klos Chromium Selection Plant and Burreli Ferrochromium Metallurgical Plan and for the giving of some incentives and guarantees to concessionaire of this agreement.

3.4.4 Environmental Legislation in Albania

The main environmental law in Albania is the "Law on Environmental Protection" (1993).
The law has provisions on environmental protection, and specific requirements on the treatment of hazardous waste, and on requirements for environmental impact assessments (EIA). Subsequently, the "Law on Environmental Impact Assessment" was adopted in 2003 (and revised in 2008). Environmental impact assessments are required for mine development and closure activities, including identification of mitigation measures for control of pollution from mining.

Other legislation related to environmental protection includes:

- "Law on Protection of Air Pollution."
- "Law on Water Reserves."
- "Law on Environmental Treatment of Polluted Water."
- "Law on Forest and Forestry Management."
- "Law on Management of Hazardous Waste."
- "Law on Environmental Management of Solid Waste."

In addition, Albania has adopted a set of environmental standards, covering air quality, water quality, noise, etc. These national environmental standards are based on EU standards.

3.4.5 Other Legislation relevant to the Mining Sector in Albania

The Concession Law (Number. 9663, dated 18.12.2006) does already have details on tendering arrangements, and the Geological Law (Number. 10227, dated 4.2.2010) has some relevance to the mining sector.

Order of Minister Nr.223 of 31 March 2008;
Monitoring of the mineral activity of the southern and central zone, the consequences of the private mineral activity and the specification of the masses necessary to avoid the danger of collapsing.

Order of Minister Nr.488 of 30 June 2008;
For the specification of the coordinates of dangerous zones and dangers of inserting upper water in the mine at Bulqiza.

Order of Minister Nr.434 of 19 June 2007;
To safeguard the environment, preventing the giving of excessive Licensing for the limestone minerals in the Fushe Kruje - Kruje.

Category and date are not available;
To solve the problem of drinking water pollution that supplies the city of Berat and the zone around it and to increase the amount of supplied water for future, for six subjects their activity was suspended pinpointing coordinates that divide the allowed zones and forbidden zones.

Category and date are not available;
To guard the human life, the giant rock that was hanging above the district of Magalem, Berat. This was seriously endangered the life of the inhabitants.

Category and date are not available;
To guard natural monuments, archaeological monuments, Geo-monuments have been identified and taken under custody to avoid damaging by the explosive materials near "Shpelles - Ujkut" in Bilisht. To guard the wall of "Kalase - Dorezit" near the village of Peze, Tirane. To guard the national road to Sarand, as a result of the exploitation of underground resources.

CHAPTER 4 STRATEGIES FOR DEVELOPMENT OF SPECIFIC MINERALS

Chromite, copper and nickel are considered to be important mineral resources for sustaining economical growth of Albania. Although, Albanian mining industry was once ranked the third in the world for production of chromite ore in the past, in recent years, the productions of chromite and cupper has fallen respectively 1/4 and 1/10 of those of 1980s. In such a circumstance, it is, therefore, urgent and important subject to find ways to expand production and improve production capacity of these minerals. For this reason, it is necessary to promote mining industry by formulating clear strategy for development of mining industry. Since the situations, such as economic viability, size of resource, scale of necessary development, location and environment of occurrence differ depending on each mineral, these three minerals are discussed separately. Further, other than three minerals of chromite, copper and nickel, abundant occurrences of non-metallic resources, such as limestone, coal and decorative stones, are known to exist in Albania. Since these resources are regarded to contribute greatly to Albanian economy in future, they were also considered in the study.

In Albania various surveys of mineral resources were conducted mainly during 1970s and 1980s following the mineral resource evaluation standard of the former Soviet Union and the Mineral Resources Database of AGS has been constructed based on this standard. But this standard of the Soviet Union is quite different from the standard currently used in western country of market economy where mineral resources data must be presented to the public, and it is difficult to attract attention of foreign investors by the mineral resources information using this standard. For that reason, before discussion of strategy of specific minerals, evaluation method of mineral resources of Albania was studied for finding the best way for future evaluation of mineral resources.

4.1 Mineral Resources Database and Economic Evaluation of Mineral Resources

For foreign investors who want to know information of mineral resources of Albania, the information sources they can access are mineral resources database of AGS (Albanian Geological Survey) and exploration report of ore occurrences mainly prepared during 1970s and 1980s by AGS. In these documents mineral resources were described using the classification system of Albania which is different from the world wide classifications, particularly those of western countries. This section describes the Albanian classification and various international classifications that are used, and proposal for adaption of the Albanian classification to be consulted with international classifications.

4.1.1 Classification of Mineral Resources in Albania

Mineral resources are evaluated based on key factors such as probability of existence, volume, ore grade and feasibility, and they are classified using these parameters so that potential investors can understand the potential of mineral resources. In Albania, classification of mineral resources has been conducted following the method of the Former Soviet Union, and the mineral resources database and geological report have been prepared based on this classification. They have been classified into A, B, C_1, C_2, P_1, P_2 based mainly on intensity of geological work and therefore probability of existence of ore deposits. Based on ITNPM (1999) descriptions of each category are given below .

Category A: These mineral resources are discovered and studied in detail to ensure full clarification of the conditions of extension, shape and construction of body of mineral resources, full nature and type of mineral resources (and industrial materials), relationship of boundaries and outlines of extent, grade classification of ore body and outline of portions without mineralization within the ore body and definition of natural factors (hydro geologic and geologic - engineering) that define the conditions of development of mine opening, preparatory, exploitation works of deposit. The outline of reserves of mineral resources is determined based on the results of detailed survey works and those of mining works mainly by gallery and drilling.

Category B: These mineral resources are discovered and studied in detail to ensure full clarification of the conditions of extension, shape and construction of body of mineral resources, full natures and type of mineral resources (and industrial materials) and their distribution manner as well, without specifying classification of the boundaries of each ore type. Grade classification and occurrences of the parts without mineralization are not as clear as Category A. Outlines of these mineral resources are defined according to the data of survey works in a limited area with extrapolation of stable thickness and quality. These mineral resources become the basis for developing mining and technological projects and object for investments for operation of mine and other facilities of mining character that are related to exploitation and processing of discovered minerals. Outline of reserves of the mineral resources is determined based on the results of detailed survey works and those of mining works mainly by drilling with combination of gallery work.

Category C_1: Mineral resources are discovered and studied in detail, to provide a clarification in general of conditions of location, shape and formation of useful ore body, type of nature, industrial types, quality, technological characteristics and natural factors that determine the conditions of developing mining -exploitation works. Contour of reserves of minerals resources is determined by survey and extrapolative works according to the data of geological drilling and geophysical works. Although these mineral resources are necessary to be promoted to categories A and B mineral resources by additional work, they can be a basis for designing and planning the investments for the development of mine.

Category C_2: Mineral resources are estimated in advance by the extrapolation of the existing data. The natures of extension, form and distribution of ore bodies are defined on the basis of geological and geophysical works that are conducted for the finding of mineral resources in a particular point or by survey data. Contour of deposits of useful minerals has been defined by boundaries of geological structures and at bodies of mineralized rocks. These reserves are the basis for planning the exploration and exploitation works and for the prospective studies and opening mine works, as well, and for the practice of Albania a base to plan and design investments for construction of mines.

Category P_1: This corresponds to the outer neighboring area of C_2 Category area. The outer margin of the area is estimated by the extension of known ore body of similar type.

Category P_2: This category corresponds to the area of high potential of mineral resources defined by geophysical and geochemical data in the area with occurrence of known ore body

Category P_3: This corresponds to all mineral resources not classified into all of the above categories.

Mineral resources classification of Albania is based on geological confidence and mineral resources are classified based on intensity of exploration work defined by intensity of galley work and grid size of drilling work. Table 4.1.1 shows relations between categories of classification and intensity of exploration work.

Table 4.1.1 Classification of mineral resources and drilling grid

Category	Probability	Galley survey and general size of drilling grid
A	90%	Mainly gallery observation with some drilling work.
B	80%	Drilling and gallery observation.
C_1	70%	Drilling grid: 50 x 50m
C_2	35%	Drilling grid: 100 x 50m
P_1	20%	Drilling grid: 200 x 100m
P_2	15%	Drilling grid: 400 x 200m

The size of drilling grid system is determined for accurate estimation of mineral resources and they can be changed depending on type and nature of mineral resources. For example, grid size of C_1 category is 50m x 50m in general, but depending on situation the following grid sizes are used.

- For ore body with irregular shape: 40x40 m, 60x30m
- For small ore body of chromites: 30x15m
- Chromites ore body in general: 40-20m: 40-40m, 60-30m
- Complicated Cu mineralization: 15-30m
- Ni ore body is simpler than others: 60-80m to 40-60m, 100-80m, and 100-100 m

4.1.2 AGS Mineral Resource Database

In the AGS mineral resources database (Table 4.1.2), mineral resources are classified into Industrial Reserves, Geological Reserves, Excavated Reserves and Present State of Reserves. Mineral resources of the AGS mineral resource database have been classified using categories of mineral resources classification of Albania. They are defined as below.

- Industrial Reserves----------A, B, C_1 categories
- Geological Reserves----------C_2 and other categories
- Total = Industrial Reserves + Geological Reserves
- Excavated Reserves----------Exploited Resource
- Present Situation of Reserves=Total– Excavated Reserves.

Industrial Reserve is used to differentiate ore reserves from Geological Reserve. The separation of these reserves is normally done using categories given above, however, there are some cases when ore grade of specific mineralization is used for separating these two reserves. Examples of these are given below.

Chromite deposit
Higher than 20Cr_2O_3:% Industrial Reserves
Lower than 20Cr_2O_3:% Geological Reserve
Nickel deposit
Higher than 0.7Ni%: Industrial Reserves
Lower than 0.7Ni:% Geological Reserve
Copper deposit
Higher than 0.7%Cu: Industrial Reserve
Lower than 0.7%Cu: Geological Reserve

For evaluation of mineral resource, cut off grade must be considered, but cut off grade changes depending on metal price. In a case of the Kukes mine, cut off was 10Cr_2O_3% but it can still be feasible at this grade if new technology is implemented or a mine is operated by open pit mining at favorable Cr price.

Table 4.1.2 AGS mineral resources database

No	Group	Type of Mineral	Name of Deposit	Industrial Reserves (1,000t)	Geological Reserves (1,000t)	Total (1,000t)	Classification	Excavated Reserves	Present State of Reserves
607	1	Chromite	(Kerul 1)	0,515	0,238	0,753	I		0,753
608	1	Chromite	(Kerul 2)				III		
494	1	Chromite	Afer Liqenjeve			1,2	I		1,2
495	1	Chromite	Almarine	112		112	II	110	2
496	1	Chromite	Balgjaj			2	I		2,0
730	1	Chromite	Bataçet	51,0	20,8	71,8	II		71,8
577	1	Chromite	Bater	3631	1091	4722	III		4722
497	1	Chromite	Bulqize	12242	6046	18292	III	13900	3102,8
731	1	Chromite	Druni i Boshtive	1,558		3,868	I		3,868
579	1	Chromite	Fusha e Kalit	6,1	7,03	13,13	I		13,13
787	1	Chromite	Fushe Kishe	9,5	18	27,5	I		27,5
580	1	Chromite	Fushe Lope	116,5	178,3	294,8	II		294,8
564	1	Chromite	Fushe Qethi	6,39	4,64	11,03	I		11,03
581	1	Chromite	Guri i Mekes	11,67	20,19	32,	I	0,7	31,3
732	1	Chromite	Kaçni	1,250		1,250	I		1,250
582	1	Chromite	Kaptina	26,85	26,62	53,47	II		53,47
733	1	Chromite	Kepet e Dik Nelit	12,58	8,250	20,830	I		20,830
498	1	Chromite	Kodra e Leres	21	19	40	I	2,5	37,5
583	1	Chromite	Kopeshti i Kalit	22,5	6,81	57	II		29,3
584	1	Chromite	Kraste	1772,1	824,1	2596,2	III	695,5	1900,7
585	1	Chromite	Letaj	28,02	53,06	81,07	II		81,07
499	1	Chromite	Liqeni i bardhe	1,48	0,74	2,22	I		2,22
788	1	Chromite	Liqeni i bardhe	0,5		0,5	I		0,5
734	1	Chromite	Liqeni i Dhive	21,88	9,84	31,72	I	2,4	29,32

(Source: AGS Mineral Resources Database)

4.1.3 Current Classification Systems in the World

In a market economy, banks, mining companies, the third shareholders involved in mining industry provide investment and support for development of mining industry in conducting exploration surveys, exploitation, processing of mineral and smelting. When they consider investment to mining activities, their main concern is risks from uncertainties. They try to make clear the visions of mineral resources based on certain classifications including parameters such as tonnage, ore grade, probability as well as factors such as geological, technological and economical aspects. For promotion of investment, it is necessary to provide an accurate assessment of mineral resources and that will reduce the risks and consequently increases investor's interests.

For Albania, foreign junior companies are considered to play important role, particularly in the exploration stage. Since many are listed companies on the stock market, it is necessary for them to prepare report of describing mineral resources under strict rules.

Among the mineral resource classification schemes of the world, the followings are generally widely accepted:

1. USBM (United States Bureau of Mine)-USGS (United State Geological Survey) classification
2. United Nations Framework Classification for Reserves/ Resources
3. Australian Joint Ore Reserves Committee Code (JORC Code)
4. Canadian CIM (Canadian Institute of Mining, Metallurgy and petroleum) Classification-National Instrument 43-101 (NI43-101)

Among these, 1 and 2 were implemented aiming at developing common classifications and nomenclatures for mineral resources, since geologists, mining engineers and others operating in the mining sector have used various terms to describe and classify mineral resources. 3 and 4 were

implemented for the ultimate purpose of preparing report to be submitted to the stock exchange office and they are controlled by strict regulations to meet the requirements and standards.

Descriptions of some of worldwide accepted classification and nomenclature of mineral resources and correlation to the Albanian classifications are given below.

1) USBM-USGS classification and classification of the former Soviet Union

The USGS collected information about the quantity and quality of all mineral resources and then common classification and nomenclature were developed by USBM and USGS (USBM and USGS, 1980). As shown in Figure 4.1.1, the classification of mineral resource of the Former Soviet Union, which is essentially the same as the Albanian classification, is shown together in the table of USBM-USGS classification. Along horizontal axis, both of the classifications correspond each other. But along vertical axis, because the Former Soviet Union classification does not have economical parameters, the former Soviet Union classifications correspond to the areas of Economic, Marginally Economic and further down to Subeconomic, which is not shown in the figure.

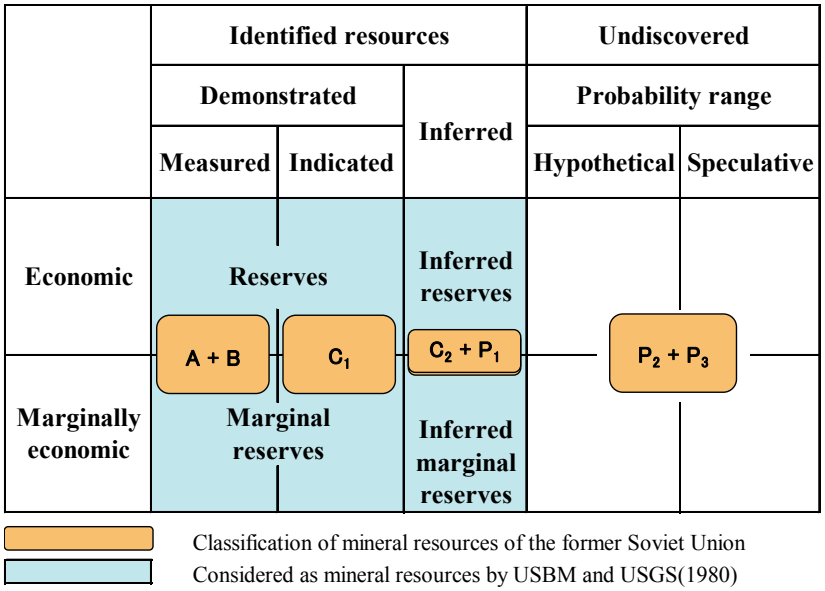


Figure 4.1.1 USBM-USGS ore resources classification

2) United Nations Framework Classification for Fossil Energy and Mineral Resources

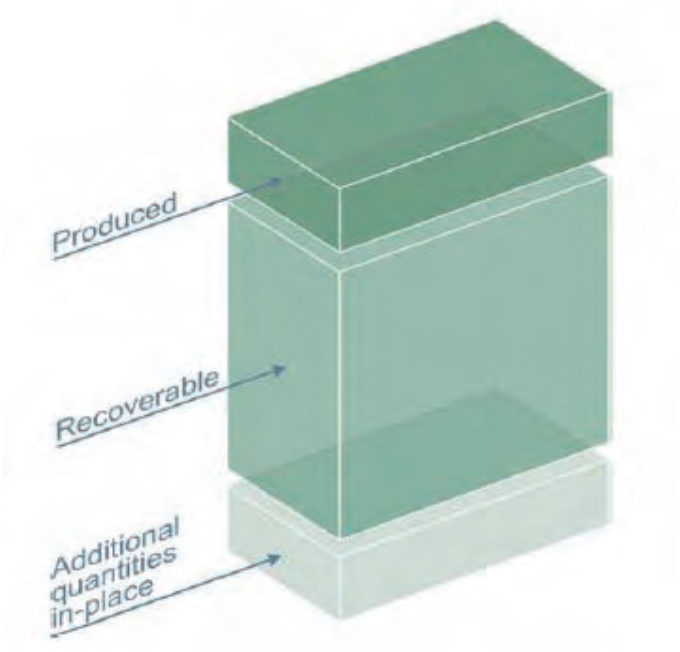
a. Summary of classification of the United Nations Framework Classification

A brief summary of United Nations Framework Classification is given below.
"The United Nations International Framework Classification for Reserves/Resources - Solid Fuels and Mineral Commodities (UNECE, 1997)" was introduced by the United Nations Economic Commission for Europe (UNECE) and adopted by the United Nations Economic and Social Council in 1997 for worldwide application. This was revised in 2004 and was called the United Nations Framework Classification (UNFC) for Fossil Energy and Mineral Resources (UNFC-2004) and revision of UNFC-2004 is now under consideration.

According to UNFC (2004), the UNFC was prepared to be a flexible system that is capable of meeting the requirements for application at national, industrial and institutional levels, as well as to be successfully used for international communication and global assessments. It is intended to meet the basic needs for an international standard required to support rational use of resources, improve

efficiency in management, and enhance the security of both energy supplies and of the associated financial resources. Furthermore, the classification is intended to assist countries with transition economies in reassessing their energy and mineral resources according to the criteria used in market economies.

In UNFC classification of mineral resource, the total resources initially occurring in-place are described in three terms of Produced Quantities, Remaining Recoverable Quantities and Additional Quantities Remaining In-Place (Figure 4.1.2). The main focus of the UNFC is on Remaining Recoverable Quantities. For non-renewable resources, the total resources initially in-place is constant, therefore, material balance is maintained. The definitions of three terms by UNFC are given below.



After UNFC-2004

Figure 4.1.2 Total initial in-place resources

Produced Quantities are included in UNFC to facilitate explanation of changes in Remaining Recoverable Quantities resulting from production that has already occurred. Produced Quantities are the sum of sales quantities and non-sales quantities as determined at their respective reference points between a specified initial time (often the time of first recorded production) up to a given date and time (normally the time of the evaluation). Non-sales quantities are considered to have intrinsic economic value.

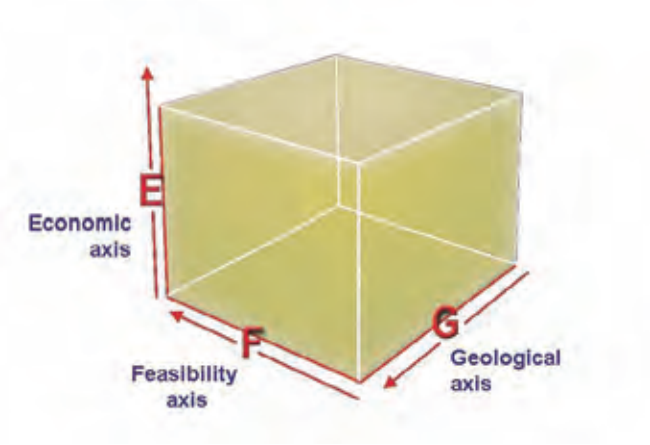
Remaining Recoverable Quantities are the sum of sales quantities and non-sales quantities estimated to be produced at the respective reference points from a given date and time forward.

Additional Quantities Remaining In-Place are quantities estimated to be in-place at the initial time, less the sum of the Produced Quantities and the estimated Remaining Recoverable Quantities. Additional Quantities Remaining In-Place are described in non-economic terms only. Their recoverability and, as a result, their economic viability, has not been assessed. Alternatively quantities may be non-economic in the sense that they may not be recovered in the future, although they may be an integral part of the recovery operations. Both forms of Additional Quantities Remaining In-place may hold intrinsic economic value, as do the recoverable non-sales quantities.

In the UNFC (United Nations Framework Classification for Fossil Energy and Mineral Resources), total remaining resources (ore deposits) are categorized using the following three essential criteria affecting their recoverability.

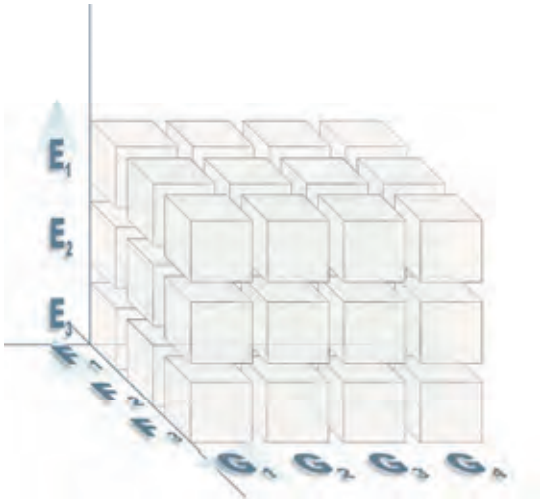
- Economic and commercial viability (E)
- Field project status and feasibility (F)
- Geological knowledge (G)

The three criteria are shown using three axes of E, F and G (Figure 4.1.3). Each of these criteria is described using categories: three main categories for economic and commercial viability (E), three for field project status and feasibility (F) and four for geological knowledge (G). Resource quantities are then grouped into classes that are defined by each of categories of E, F and G represented by the sub-cubes (Figure 4.1.4).



After UNFC-2004

Figure 4.1.3 Principal elements of the UNFC



After UNFC-2004

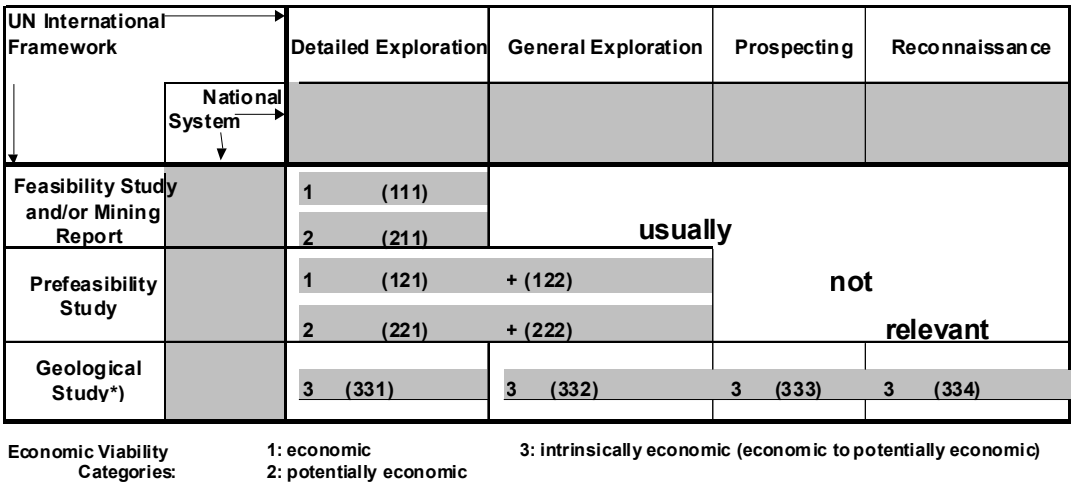
Figure 4.1.4 Classification of categories

The three dimensions of categorization are represented by the edge of a cube and digits are quoted in the order of E, F and G. Numbers, 1, 2, 3 and 4, are used to designate the different classes in the order of higher rank, in other word, higher degree of economic viability, more advanced project status and higher quality of geological assessment. For convenience, only three-digit numerical codes for individual categories are used in UNFC.
The categories of UNFC are given in Table 4.1.3. Subcategories may be added under the main categories when required. A sub-category is separated from the main category numbered by a decimal point, e.g. E1.1.

Table 4.1.3 Criterion and category of UNFC classification

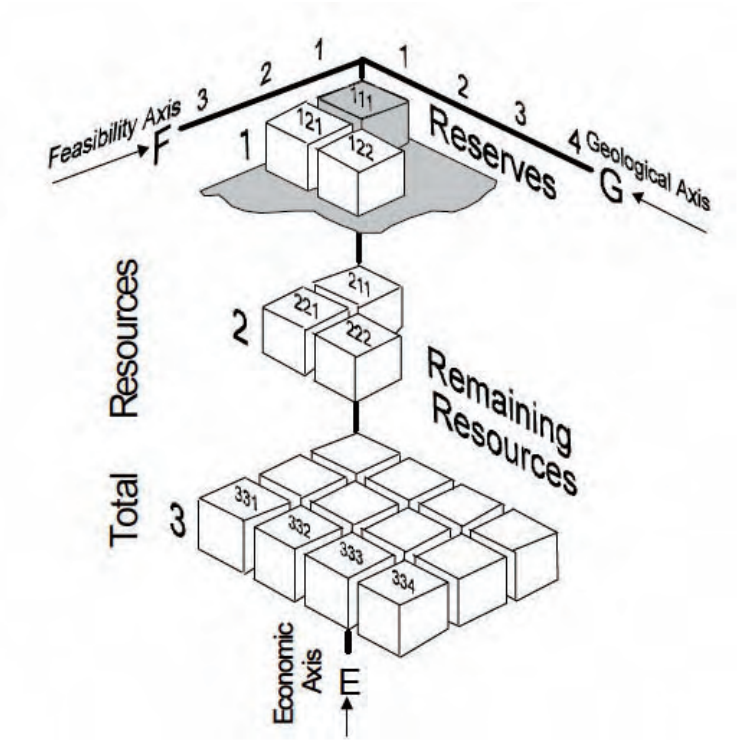
Economic axis (E)	Feasibility axis (F)	Geological axis (G)
E1:Economic E1.1: Normal Economic E1.2: Exceptional Economic	F1:Mining Report and/or Feasibility Study F1.1 Mining Report F1.3: Feasibility Study	G1:Detailed Exploration
E2: Potentially Economic E2.1: Marginal Economic E2.2 Sub-Marginal Economic	F2: Pre-feasibility Study	G2:General Exploration
E3: Intrinsically Economic	F3: Geological study	G3: Prospecting
—	—	G4:Reconnaissance Study

Among the 36 (3x3x4) categories that theoretically exist, only limited categories are applicable in practice for mineral resources, since feasibility study can not be conducted, then no economical evaluation, for the projects with poor geological and technical information. Considering this, 10 applicable categories are given in Figure 4.1.5 and they are shown three dimensionally in Figure 4.1.6. However, if necessary, other classes may also be used such as 311 for the mines that have been closed down but are still included in the national inventory. The criteria of applicable categories are given in Table 4.1.4.



After UNFC-2004

Figure 4.1.5 Applicable categories of UNFC



After UNFC-2004

Figure 4.1.6 Three dimensional presentation of applicable categories

Table 4.1.4 Criterion of applicable categories

After UNECE (2000)

Code	Economic Axis	Feasibility Axis	Geological Axis
111	Economic	Feasibility Study & Mining Report	Detailed Exploration
121		Prefeasibility Study	
122			General Exploration
211	Potentially Economic	Feasibility Study & Mining Report	Detailed Exploration
221		Prefeasibility Study	
222			General Exploration
331	Intrinsically Economic	Geological Study	Detailed Exploration
332			General Exploration
333			Prospecting
334	Undetermined Economic		Reconnaissance

The terms of Reserves and Resources are generally used for mineral resources in many countries, however, they have variety of meaning in various national classifications in the world. The UNFC Task Force worked for this issue and prepared joint CMMI (Council of Mining and Metallurgical

Institutes) /UNFC definition for mineral resources and reserves (UNECE 2000). The relations between CMMI and UNFC categories are shown in Table 4.1.5.

Table 4.1.5 Relations between CMMI and UNFC categories

Modified from UNECE (2000)

Code	CMMI Category	UNFC Category	Albania
111	Proved Mineral Reserve	Proved Mineral Reserves	
121	Probable Mineral Reserves	Probable Mineral Reserves	
122			
211	Measured Mineral Resource	Feasibility Mineral Resources	
221	Indicated Mineral Resources	Prefeasibility Mineral Resources	
222			
331	Measured Mineral Resources	Measured Mineral Resources	A+B
332	Indicated Mineral Resources	Indicated Mineral Resources	C_1
333	Inferred Mineral Resources	Inferred Mineral Resources	C_2+P_1
334	not available	Reconnaissance Mineral Resource	P_1,P_2,P_3

Based on the definition, Mineral Reserves must be mineable or economically viable. Therefore this term is applicable only for the classes (111), (121) and (122), corresponding to the economical part of mineral resources confirmed either by Feasibility Study/Mining Report or Prefeasibility Study, while all of the rest of the categories are Mineral Resources.

Feasibility Study is conducted for the purpose of assessing the technical and economic viability of the project and supporting a decision regarding project development. A Feasibility Study must fulfill the following essential functions (UNECE 2004):

- Provide a comprehensive framework of established and detailed facts concerning the mineral project.
- Present an appropriate scheme of exploitation complete with plans, designs, equipment lists, etc., in sufficient detail for accurate cost estimation and associated economic results.
- Indicate the most likely profitability on investment in the project, assuming the project is equipped and operated as specified in the report.
- Provide an assessment of pertinent legal factors, financing alternatives, fiscal regimes, environmental regulations, and risk and sensitivity analyses on important technical, economic, political, and financial variables affecting the project.

The Total Mineral Resource is defined as naturally occurring concentrations of mineral raw material of economic interest and with specified geological certainty. A Mineral Reserve is the economically mineable part of Total Mineral Resource as demonstrated by feasibility assessment. The Remaining Mineral Resources is the balance of the Total Mineral Resource that has not been identified as a Mineral Reserve (Figure 4.1.6).

The mineral resources outside of Reserves/Resources classifications are Occurrences, constituting either indication of mineralization without specified geological certainty, termed Mineral Occurrence, or a mineral concentration of no economic interest, termed Uneconomic Occurrence. Both terms have been defined to demonstrate the boundaries of the UNFC classification and at the same time to clarify the different meanings with which the term “occurrence” has so far been used.

b. UNFC classification and Albanian classification

In Albania, mineral resources are classified into A, B, C_1, C_2, P_1, P_2 and P_3 according to the criteria of the classification system used in Albania. Mineral resources in geological reports and mineral resources database of Albania are described based on this classification. Although the UNFC classification is based on the three indexes of Economic (E), Feasibility (F) and Geologic (G), two of three main indexes, Economic and Feasibility are absent in Albanian description of mineral resources. Therefore, for feasibility and economic viabilities of Albanian mineral resources, only category 3 is given to both indexes, even if detailed exploration work has been conducted. As shown in Table 4.1.5, A and B of Albania classification correspond to 331, C_1 to 332, C_2 and C_3 to 333 and P_1, P_2, P_3 to 334. If foreign investors interested in undertaking mining activities, including exploitation of Albanian mine, it is at first necessary for them to study and estimate the feasibility and economic viability of mineral resources.

As shown in Tables 4.1.5, none of the mineral resources of Albania, therefore, can be classified into Mineral Reserves according to the definition of UNFC but they are Mineral Resources without confirmation of being economically mineable. According to the UNFC, all of the Albanian mineral resource is classified into either Measured or Indicated or Inferred or Reconnaissance Mineral Resources depending on the intensity of geological work conducted to mineral resources.

3) Australian Joint Ore Reserves Committee Code (JORC Code)

a. Summary of JORC code

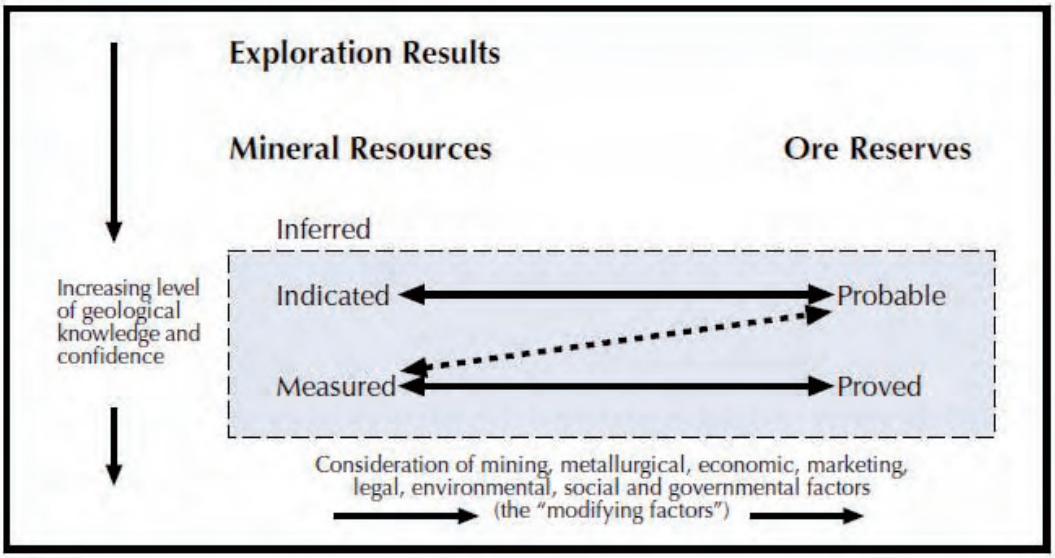
A summary of JORC code is given below:

JORC (The Joint Ore Reserves Committee of the Australasian Institute of Mining and Metallurgy, Australian Institute of Geoscientists and Mineral Council of Australia) was established in 1971 and the first edition of JORC Code, containing recommendation on the classification and public reporting of ore reserves, was released in 1989. The JORC Code, in another word, "The Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves" currently used is 2004 edition. Since 1989 and 1992, the Australian Stock Exchange: (ASX) and the New Zealand Stock Exchange (NSX), respectively, incorporated the code into their listing rules. Under these listing rules, a public report must be prepared in accordance with the code, if it includes a statement on exploration results, mineral resources or mineral reserves.

The JORC Code consists of 44 Clauses with one table titled as "Check List of Assessment and Reporting Criteria" and one appendix "Generic Terms and Equivalents". The main principles governing the operation and application of JORC Code are transparency, materiality and competence (Clause 4). For each main principal following comment are added.

- Transparency: It is required that the reader of a public report is provided with sufficient information, the presentation of which is clear and unambiguous, to understand the report and is not misled.
- Materiality: It is required that a public report contains all the relevant information which investors and their professional advisers would reasonably require, and reasonably expect to find in report, for the purpose of making a reasoned and balanced judgments regarding the exploration results, mineral resources or ore reserves being reported.
- Competence: It is required that the public report be based on work that is the responsibility of suitably qualified and experienced person who are subject to an enforceable professional code of ethics.

For classification of mineral resources and ore reserves the terms shown in Figure 4.1.7 are used.



(After JORC)

Figure 4.1.7 General relationship between exploration results, mineral resources and ore reserves of JORC

In the JORC code, tonnage classification and grade estimates of mineral resources are made based on different levels of geological confidence and different degrees of technical and economic evaluation. Strict definitions are set for use of Mineral Resources and Ore Reserves in the code and they are defined as follows.

- A Mineral Resource is a concentration or occurrence of material of intrinsic economic interest in or on the Earth's crust in such form, quality and quantity that there are responsible prospect for eventual economic extraction. The location, quantity, grade, geological characteristics and continuity of a mineral resource are known, estimated or interpreted from specific geological evidence and knowledge (Clause 19).
- An Ore Reserve in the economically mineable part of a measured and/or indicated Mineral Resource. It includes diluting materials and allowance for losses, which may occur when the material is mined. Appropriate assessment and studies have been carried out, and include consideration of by realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors (Clause 28).

The Mineral Resources can be estimated mainly by a geologist on the basis of geo-scientific information with some input from other discipline. Ore Reserves, which are a modified sub-set of the Indicated and Measured Mineral Resources, require consideration of the Modifying Factor, being necessary to be considered and modified by realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors.

By the JORC code, Mineral Resources are sub-divided, in order of increasing geological confidence, into Inferred, Indicated and Measured categories and Ore Reserves are sub-divided in order of increasing confidence into Probable Ore Reserve and Proved Ore Reserve.

In the JORC code, Mineral Resources and Ore Reserves are clearly differentiated, the former being a concentration or occurrences of material of intrinsic economic interest, whole the latter being the economically mineable part of a Mineral Resource. For conversion of Mineral Resource and Ore Reserve, it is not required that a final feasibility study has been undertaken, but it does require that appropriate studies will have been carried that will have determined a mine plan that is technically achievable and economically viable, and that all Modifying Factors have been considered (Table 1 of the JORC code). Since the Modifying Factor includes factors such as mining, metallurgical, economic,

marketing, legal, environmental, social and governmental factor, the Modification Factor is not so much different from conducting feasibility or pre-feasibility studies.

b. JORC code and Albanian classification

JORC code is intended for preparation of public reports based on guideline of JORC (Table I of JORC code). Although various reports were prepared for mineral resources of Albania by detailed geological work, they are prepared based on the Albanian standard. Further, mineral resources of Albania are classified by the Albanian standard and they lack information that should be included in the Modifying Factor of JORC code such aspects as technological, economical, environmental, etc.

If the conversion of Albanian classification of mineral resources to JORC code is made by disregarding the differences of exploration methods between Albania and JORC code, all the categories of Albanian classification belong to Mineral Resources because of lack of the Modifying Factor information. A and B correspond to Measured Mineral Resources, C_1 to Indicated Mineral Resources and C_2 and P_1 to Inferred Mineral resources.

4.1.4 Adaptation of the Albanian Classification to the International Classification

Considering the location of Albania in the global mining perspective, the most preferable international standard to be considered for the conversion of the classification and evaluation of mineral resources of Albania is the UNFC classification. Further, UNECE recommended implementing this classification for the countries of transitional economy, particularly the countries of Central and Eastern Europe, aiming to facilitate and increase the trade and cooperation between countries of market economy and transitional economy. There have been some attempts, such as ITNPM (1999), ITNPM and AGS (2005) and Alliu (2009) to evaluate mineral resources of Albania in line with the UNFC classification of mineral resources, but no clear solutions and conclusions have been obtained. One of the examples of ITNPM and AGS (2005) is given below.

In ITNPM and AGS (2005), mineral resources data of Albania are shown using the three axes of Geological, Feasibility and Economic in accordance with UNFC classification. Examples of chromite and copper deposits are shown in Table 4.1.6.

The following criteria were used for showing mineral resource data of Albania using the three axes of UNFC classification. The Albanian mineral resources were directory correlated to the categories of Geology axis of UNFC classification; A and B to Category 1, C_1 to Category 2 and C_2 to Category 3. Criterion of categories of Feasibility Axis differs depending on minerals. For nickel deposits, no ore type of nickel corresponds to Category 1 of Feasibility Axis and Category 2 corresponds to nickel-silicate ore. For chromite deposit, classification of category of Feasibility Axis was decided by grade of chromite ore based on price of chromite ore. It was less than US$100/ton at time of consideration. Category 1 corresponds to chromite ore with more than $40Cr_2O_3$% and chromite ore of less than $40Cr_2O_3$% correspond to either Category 2 of 3 depending on situation of mineral resources. Classification of Economic Axis was done based on profitability at the function of production cost (C) and metal price (P). Category 1 corresponds to mineral resource of high possibility of profitability with $1.5<P/C$ and Category 2 corresponds to mineral resource expected to be profitable with $1<P/C<1.5$, while, Category 3 corresponds to mineral resources with $P/C<1$ from which profit is not expected at the metal price of the time of consideration.

Although some efforts were done for considering the feasibility and economic viabilities, all considerations still lack for assessing feasibility and economic viabilities of UNFC classification. Since feasibility studies at international level have not been conducted for mineral resources in Albania, it is difficult to make category classification of UNFC using Feasibility and Economic axes.

Table 4.1.6 UNFC classification of Albanian mineral resources (chromite and copper)

Chromite

No	Source	Reserves Tons	Axis				
			Geology	Feasibily	Economic		
					1	2	3
1	Northern Bulqiza	190,408	1	1	190,408		
		2,180,860	2	1	2,180,860		
		1,197,876	3	2	1,197,876		
	Total	3,569,144	1+2+3	1+2	3,569,144	0	0
2	Western Zone +Gal 1050	15,100	1	1		15,100	
		297,100	2	2			297,100
		143,400	3	2			143,400
	Total	455,600	1+2+3	1+2	0	15,100	440,500
3	Batra	122,444	1	1	12,038	46,126	64,280
		342,830	2	2	16,628	12,000	314,202
		264,990	3	3	438	27,368	237,184
	Total	730,264	1+2+3	1+2+3	29,104	85,494	615,666

Copper

		Quantity	Cu	Au	Ag	Axis		
No	Source	Tons	%	g/t	g/t	Economic	Feasibily	Geology
1	Rubic	4,582	1.76	0.43	1.50	2	2	1
		78,810	1.77	0.43	1.58	2	2	2
		94,894	1.99	0.43	1.50	2	2	3
	Total	178,286	1.89	0.43	1.54	2	2	1+2+3
2	Southern Perlat	648,333	2.82	1.28	12.75	1	2	2
		753,912	2.81	1.28	12.75	1	2	3
	Total	1,402,245	2.87	1.28	12.75	1	2	2+3
3	Batra	6,790,900	1.35	1.03	10.30	1	2	2
		1,194,053	1.10	1.03	10.30	1	2	3
	Total	7,984,953	1.31	1.03	10.30	1	2	3

（After ITNPM and AGS, 2005）

4.1.5 Use of the Past Albanian Data and Evaluation Method for Future

If conversion of classification of Albanian mineral resources was done into international classification, such as UNFC classification or JORC code, all the categories of Albanian classification decrease validity and they belong to either Measured or Indicated or Inferred or Reconnaissance Mineral Resources (Table 4.1.7). Since mineral resources information of Albania lack information of feasibility and economic viability that are normally included in the feasibility study of the countries of market economy, Albanian mineral resources can not be classified as using the term of Reserves. Therefore, the term Resource must be used instead of Reserves in the AGS database as shown in Table 4.1.8.

Based on the present state of mineral resource information of Albania, even the mineral resources with detailed exploration work and high grade can not be classified as reserves and remain under the category of Resources. Only after completion of feasibility study and economic variability consideration, would it be possible for them to be included as Reserves.

Table 4.1.7 Comparison of classifications

UNFC classification		JORC code	Albania
Proved Mineral Reserves	111	Proved Ore Reserves	
Probable Mineral Reserves	121	Probable Ore Reserves	
	122		
Feasibility Mineral Resources	211		
Prefeasibility Mineral Resources	221		
	222		
Measured Mineral Resources	331	Measured Mineral Resources	A+B
Indicated Mineral Resources	332	Indicated Mineral Resources	C_1
Inferred Mineral Resources	333	Inferred Mineral Resources	C_2+P_1
Reconnaissance Mineral Resource	334		P_1,P_2,P_3

Table 4.1.8 International classification and AGS database

AGS database	Albanian classification	UNFC and JORC (lower category is applied)
Industrial Reserves	A, B, C1	Indicated Mineral Resources
Geological Reserves	C2	Inferred Mineral Resource
Total Reserves	A,B,C1+C2	Inferred Mineral Resources
Excavated Reserves	-	Excavated Resources
Present Situation of Reserves	A,B,C1,C2-Excavated Reserves	Present Situation of Resources

According to the UNFC classification, definition of feasibility study is give as below.

> *A Feasibility Study assesses in detail the technical soundness and economic viability of a mining project, and serves as the basis for the investment decision and as a bankable document for project financing. The study constitutes an audit of all geological, engineering, environmental, legal and economic information accumulated on the project. Generally, a separate environmental impact study is required.*

In the case of existing chromite mine in Albania, the following works are considered to be necessary to prepare a feasibility study acceptable to UNFC classification (Alliu, 2009).

- 1 ton of ore samples from each of mine for the preliminary testing of the process of ore processing to obtain chromite concentrate for smelting to produce ferrochrome; .
- redefinition of the mineral blocks and recalculation of the ore reserves according to the UNFC standard;
- open pit and underground mine design optimization for new mine, avoiding the negative effects of the old unsafe mine workings;
- the flow sheet for the concentration plant to upgrade the chromite mined to a 40 - 50 % Cr_2O_3 concentrate ready for use in ferrochrome production;
- geotechnical study for the estimation of the geological – engineering conditions in the ore deposits to avoid the collapses in the new mines;
- environmental study following the EU standard;

- economic study
- compilation of a Feasibility Report

For conducting a feasibility study, it is, therefore, necessary to have a large budget.

Since classification of mineral resources of Albania have been done following the method of the Former Soviet Union, there would be some confusion for foreign investors to see the Albanian classification of mineral resources. However, mineral resources data, such as Mineral Resources Data Base of AGS and geological reports of mineral resources mainly done during 1970 and 1980, are well organized and rigorous, based on the systematic exploration work such as grid drilling. It is considered to be reliable as basic data and it can be used as reference for planning exploration and mining projects. It would be complicated and unrealistic to transfer the mineral resource data of the past based on the different criteria of international standard, because the mineral resources database is connected to many factors such as exploration policy, survey method and assaying. Even if this was transferred based on international standard in certain way, it is difficult for foreign investors to fully accept the results and they are considered as only reference data. Although, foreign investors may not be familiar with Albanian classification of mineral resources, if detailed explanation of classification and ore reserves calculation were attached to the Mineral Resources Database, foreign investors would effectively make use of the past data of Albania. Considering promotion of foreign investment to Albania, it is necessary for mining sector of Albania to become familiar with the international standard of mineral resource classification. It is proposed that METE and AKBN should make regulation of using world standard of classification and ore reserves calculation for the documents to be submitted to METE and AKBN. The recommended system of classification is UNFC classification or JORC code. Both of the classifications are essentially similar and it is necessary to conduct feasibility studies (consideration of Modifying Factor similar to feasibility study in case of JORC code) for mineral resources to be classified as mineral reserves with economic viability.

4.2 Chromite

4.2.1 Chromite Mine of Albania

1) Geological situation

Two types of chromite deposits found in different geological environment are known in the world. The one is stratiform type with widespread lateral extension, being associated with layered intrusion and the other is podiform type chromite found in harzburgite in the ultramafic rocks of ophiolite sequences (Arai,1997、Gervilla and Leblanc, 1990 and others). The chromite deposits of Albania are podiform type occurring mainly in harzburgite of the ophiolite sequence. The podiform type chromite deposit generally shows a small scale irregular distribution and chromite of it generally has high Cr and Al.

Ultramafic rocks of the ophiolite sequence occur in NNW-SSE trending two zones of the Eastern Ophiolite Belt (EOB） and Western Ophiolite Belt (WOB) in Albania (Figure 4.2.1). The ultramafic rocks of the Eastern Ophiolite Belt mainly consist of harzburgite while those of the Eastern Ophiolite Belt mainly consists of lhezolite(Meco and Aliaj, 2000). Chromite deposits of higher Cr_2O_3 grade occur in the Eastern Ophiolite Belt, while podiform chromite bodies with lower Cr_2O_3 grade are only rarely found in the Western Ophiolite Belt.

The chromite deposits of the Eastern Ophiolite Belt occur in the complicated shape such as tabular sub-concordant, concordant, pencil-like and other podiform morphologies cut by many faults through tectonic movement and deformation. Similar to chromite deposits of the ophiolite types of elsewhere in the world, the chromite deposits are mainly found in the locations of 400 to 700m below the petrologic Moho, (boundary between mantle sequence consisting of tectonic harzburgite and crust sequence consisting of layered gabbro). In the mantle sequence, chromite deposits are most commonly found in the units of harzubargite-dunite, dunite-harzburagite and massive dunite units.

Chromite deposits of Albania mainly occur in three main bodies of ultramafic rock, Tropoja, Kukes, Bulqiza, Shebeniku-Pogradec. As shown on the Tables 4.2.1 and 4.2.2, more than 25.6 million tons of chromite ore has been produced in Albania. The chromite ore produced from the Bulqiza massif account for 82% and the production of chromite ore from each of other ultramafic massif is less than 10%. For the mineral resources of chromite ore, the Buqiza massif account for 56% of the total resources and each of Tropoja and Kukes massif has nearly 20 % of the total.

In the ultarmafic massifs of Albania, approximately 1,100 ore deposits and mineral showings of chromite are known. By the recent report (AGS 2008), chromite resources of 37 million tons in total were reported from which 7 million tons are of high grade with over 46Cr_2O_3% and 3.1 of Cr/Fe ratio. Among these chromite deposits, many of them are small with ore resources of about 100,000 tons and approximately 30 ore deposits fall in a range of 500,000 to 1,000,000 tons, and several of them are over 1,000,000 tons.

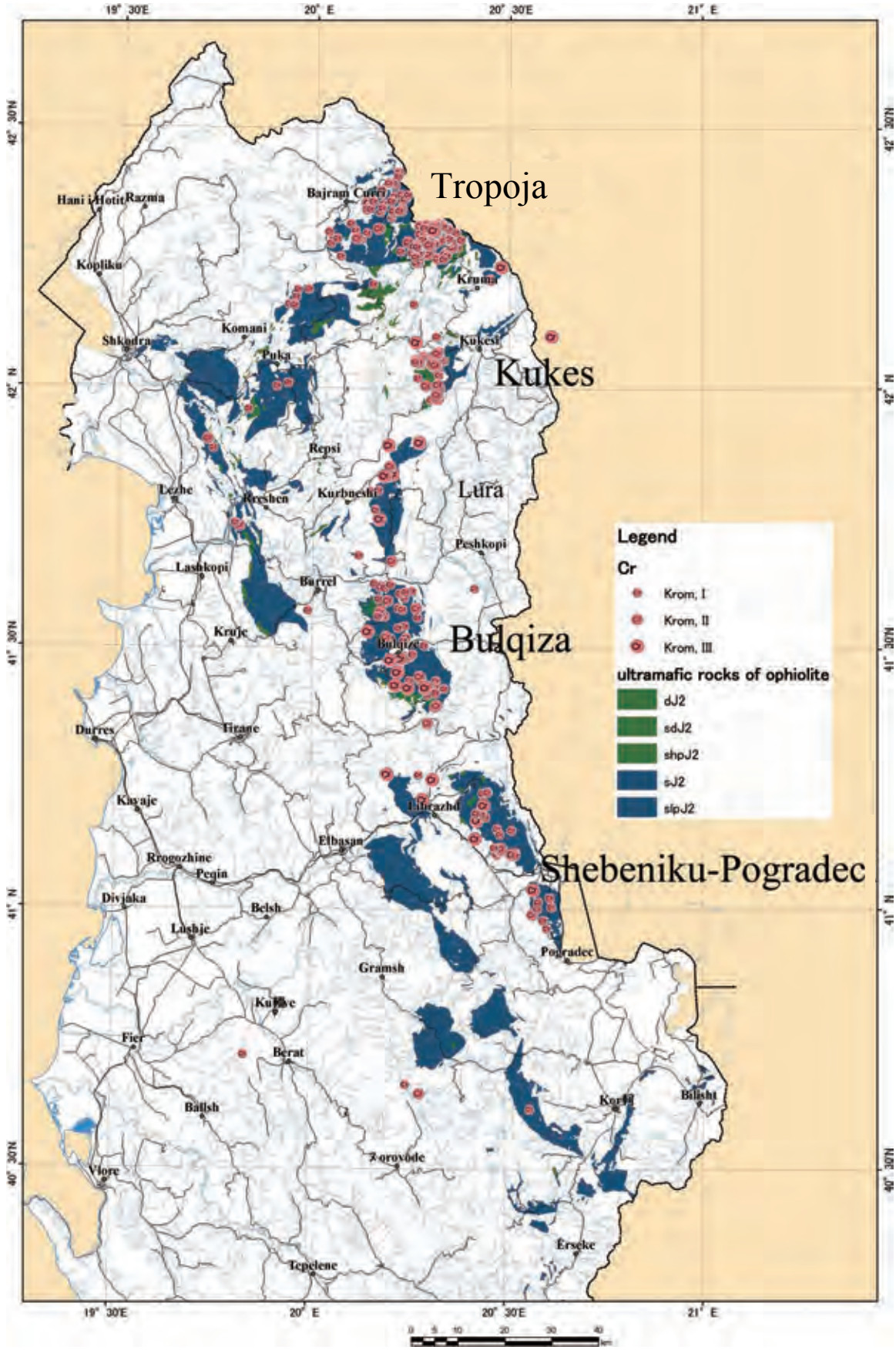


Figure 4.2.1 Distribution of chromite deposits and ultramafic massif

Table 4.2.1 Chromite resources and ultarmafic rock

Name of ultramfic massif	Production of Cr ore		Mineral Resources ($B+C_1+C_2$)		Main chromite deposits
	(1,000t)	%	(1,000t)	%	
Tropoja	1,500	6	6,097	18	Vlahna, Zogaj
Kukes	2,500	10	6,828	21	Kalimash, Perroi Batres
Lura	15	0	351	1	
Bulqiza	21,000	82	18,292	56	Bulqiza, Batra, Buall Pass, Thekna, Shkalla, Ternova, Krast-Lugi I Thelle, Selishata-Dervish Lake, Ceruja
Shebeniku-Pogradec	600	2	1,235	4	Katjel, Pojska
Total	25,615	100	32,803	100	

（modified from ITNPM and AGS, 2005）

Table 4.2.2 Chromite resources of each ultramafic massif

	Location	Area	Thickness	Depth of explored ore bodies	Geological resource	Grade Cr_2O_3%	Production in 2007	Perspective	Perspective Deposits	Number of deposits	Number of mining permits
Tropoja Massif	100km north of Tirana	440 km^2	6-8km	300m	6.1 million tons	26.48%	34% 1,268t 36-38% 16,754t 40% 22t	Rich chromium bodies can be encountered under 300 m.	Zogaj, Vlahna, Qaf-Perollaj	286	26
Kukes Massif	80km East-North of Tirana	106km^2	about 5km	300m	6.8 million tons	21.40%	34% 2,553t 36% 400t	Rich chromium bodies can be encountered under 300 m.	Kalimash, Perroi, Batres	54	3
Bulqiza Massif	40km east-north of Tirana	370km^2	4-6km	1,300m	12 million tons	7.5 million tons at 38%	36-40%: 145,431 t Concentrates: 11,000 t	Many mines are operational	North Bulqiza, Qaf-Bualli, Batra in sides and depth Krasta in depth Thekna in depth Intermediate zones of Batra-Liqeni, Sopeve-Thekna-Ternova.	65	104
Shebeniku-Pogradec Massif	65km east-south of Tirana	270km^2	4km	300m	1.2 million tons	over 38%	36%, 5,355t	It is a massif less investigation and exploration	Katjel-Pojska, Bushtrica-Perroi, Govates	115	11

(source: Data of AKBN)

In the database of AGS, 295 chromite deposits are listed. Among these deposits, 190 deposits (64%) are small scale with a total resource (Industrial Resource + Geological Resource) of less than 50,000 tons, while 34 deposits (12%) are relatively large scale with a total resource of more than 500,000 tons. (Table 4.2.3).

Table 4.2.3 Size of chromite deposit of Albania

Size	Resource	Number of deposits	%
I	**0-50,000**	**190**	**64**
II	**50,000-500,000**	**71**	**24**
III	**>500,000**	**34**	**12**
Total		**295**	**100**

The major mines of each ultarmafic massif are shown on Table 4.2.4. In the Tropoja massif, Vlahna and Zogaj mines are large and most prospective mines with geological reserves of 2.5 million tons and 1.2 million tons, respectively. In the Kokes massif, the largest mine is Kalimash mine, consisting of Kalimash 1, Kalimash 2, Kalimash 3 and Perroi Batres, with a total of 5.1 million tons of resources. Among many mines of the Bulqiza massif, the largest mines are Bulqiza and Batra mines, both of which respectively produced 13.0 million tons and 5.6 million tons. Although there are not large chromite mine in Shebenik-Pogrdec massif, Katejel and Pojska mines are operational mines.

Table 4.2.4 Main chromite mine of Albania

Massif	Name of mine	Start of operation	Production	Destinations	Situation of resource As of Jan. 1, 2006	Perspectives	Mine Status
Tropoja Massif	Vlahna Mine	1986	45,000t (1986 to 1996)	partly export (30%Cr2O3) and for enrichment	2.56 mill.t (29.2%Cr2O3)	It is possible to discover reserves with over 38%Cr2O3	Southern part is occupied by private sectors, while center and northern parts are unoccupied
	Zogaj mine	1980	520,000t (1980 to2000)	export for enrichment in chromium dressing plant in Deva, Kosovo	1.238 mill. t. (24-28%Cr2O3)	It is opened at depth and in sides	It is unoccupied since closed in 2000.
Kukes Massif	Kalimash 1, 2, 3 and Perroi Batres	1978	1,460,000t (1978 to 1997)	For enrichment	5.1 mill. t. (18-23%Cr2O3) Kalimash 1:1.9 mill. t. Kalimash 2: 0.4 mill. t. Kalimash 3: 1.6 mill. t. Petrroi Batres: 1.2 mill. t.	Could meet rich chromium bodies	The mine was closed in 2000. Tender was held in June 2009

Massif	Name of mine	Start of operation	Production	Destinations	Situation of resource As of Jan. 1, 2006	Perspectives	Mine Status
Bulqiza Massif	Bulqiza Mine	1948	more than13,000,000t .(1948 to present):		Over level 16: 690,000 t. (46.75%Cr2O3) Under level 16: 2,126,800 t. (44.91%)		Concession since 2001.
	Batra Mine	1967	5,610,000 t (1968-2006) at 38%Cr2O3 220,000 t (1999-2006)	export and enrichment	730,000 t.	It is open in deepness and in the sides	Since 1999, given to 12 private companies that are working independently in different adits
	Thekna Mine	1959		export	652,300 t.	It is open in deepness and in the sides.	Since 1999, given to 17 private companies that are working independently in different adits
	Krasta Mine	1971		enrichment	2 mill. t.		After 1999, some galleries were given to 4 private companies and other were enclosed
	Lugu Gjate-10 Korriku Mine	1968		export	69,800 t.(42%Cr2O3)	Open in a deepness	After 1999, given to 5 private companies working independently in the adits
	Fush-Lopa Mine	1989		export	79,900 t.(44%Cr2O3): Jan. 1, 2006	Open in deepness and extension	After 1999, it was given to 3 private companies working independently in the adit of mine

Massif	Name of mine	Start of operation	Production	Destinations	Situation of resource As of Jan. 1, 2006	Perspectives	Mine Status
Shebeniku-Pogradec Massif	Katjel Mine	1982	72,000t (2000-2006) at average 36%Cr2O3	export	145,916 t. (45.27%Cr2O3)		Since 2000, included in concession agreement
	Pojska Mine	1988	216,000t (1988 to 1997) Average 40-42%Cr2O3	export	16,000t (23-28%Cr2O3)		Included in concession agreement

(source: AKBN data)

4.2.2 Situation of Chromite Mining in the World

Chromite mining in the world is dominated by the countries with large chromite mines of annual ore production of more than 1 million tons, such as South Africa and Kazakhstan (Table 4.2.5). In Albania, the largest producer of chromite ore is Albanian Chrome, operating in Bulqiza mine, with annual production of approximately 80,000 tons and the rest of them are mostly small companies with annual production of less than 10,000tons. For consideration of Albania chromite mining in future, it must be premised that chromite industry of Albania can not share a large part of the world market

Table 4.2.5 Chromite mines of the world

	Company	Mine	Capability of production 1,000t/year (estimated)
South Africa	Sanancor Chrome (Kermas South Africa)	Eastern Chrome, West Chrome, Lavino Chrome, Marco Chrome	3,500
	Xstrata South Africa	Waterval East, WatervalWest, Thorncliffe, Krondal, Marikana	2,800
	Assmang	Dwarsriver, Bayer, Ntuane, Groenfontein, Vogelstruisne	800
	Hernic Ferrochrome	Elanskraal, Maroelabuil	500
	Merafe Resources		400
	ASA Metals	Dilokong	400
		Total	8,400
Kazakhstan	Kazchrome	Donskoy	3,500
India	India Charge Chrome (ICCL)		
	India Mtais (INFA)		
	FerroAlloys Corporation (FACOR)		
	Tata Iron and Company (TISCO)		
		Total	3,300
Finland	Outokumpu	Kemi	7,000
Zimbabwe	Zimasco	Shurgwi, Mutrashanga	
	Zimbabwe Alloy		
	Maranatha		
		Total	650
Turkey	Etibannk		600
Brazil	Ferbasa		500
Russia	Chelyabinsk Electoromettallurgical	Harp	
	Kongor-Khfom	RAI-iz	
		Total	500
Australia	Consolidate Minerals	Coobine	300
China			250
Iran	Faryab Mining	Sfaryab, Es fandegeh, Sabzebar	200
Albania	Albchrom SH A Tirana	Batra, Kalimaash, Bulqiza	200
Pakstan			130
Madagascar		Ankazotaolane, Bemanevika	100
Others	Total		120
Total			19,450

(source: International Chromite Association）

The world production of chromium is dominated by four countries (South Africa, India, Kazakhstan, Turkey) accounting for 84% of the world production (Table 4.2.6, Figure 4.2.2). Among these, Albania produced approximately 200,000 tons of chromite ore in 2008, accounting for nearly 1% of world chromite ore production.

Table 4.2.6 Production of chromite in the world

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
South Africa	6,817.1	6,620.8	5,225.2	6,428.1	7,974.0	7,625.2	7,502.8	7,428.5	9,647.0	10,300.0
India	1,450.0	2,066.0	1,930.0	2,707.1	3,219.5	3,583.6	3,357.0	3,865.0	4,837.0	4,236.0
Kazakhstan	2,405.5	2,606.6	2,045.7	2,369.5	2,927.9	3,287.1	3,581.0	3,366.0	3,687.0	3,629.0
Turkey	1,014.5	545.7	454.5	326.4	229.3	436.6	722.0	1,000.0	1,700.0	2,000.0
Russia	50.0	80.0	117.7	71.0	116.5	320.2	772.0	966.1	776.7	750.0
Zimbabwe	653.5	668.0	780.2	749.3	725.8	668.4	665.0	700.0	650.0	650.0
Brasil	190.5	253.2	174.0	284.0	376.9	593.5	616.5	562.7	627.8	630.0
Finland	597.4	628.4	575.1	566.0	549.0	580.0	572.0	549.0	556.0	614.0
Albania	12.0	10.0	4.0	15.0	0.0	0.0	0.0	201.0	200.0	207.0
Others	557.6	631.6	516.7	670.3	759.6	826.0	839.9	866.7	908.6	1,056.0
Total	13,736.1	14,100.3	11,819.1	14,171.7	16,878.5	17,920.6	18,628.2	19,304.0	23,390.1	23,865.0

(1,000t)

(source: World Metal Statics Year Book)

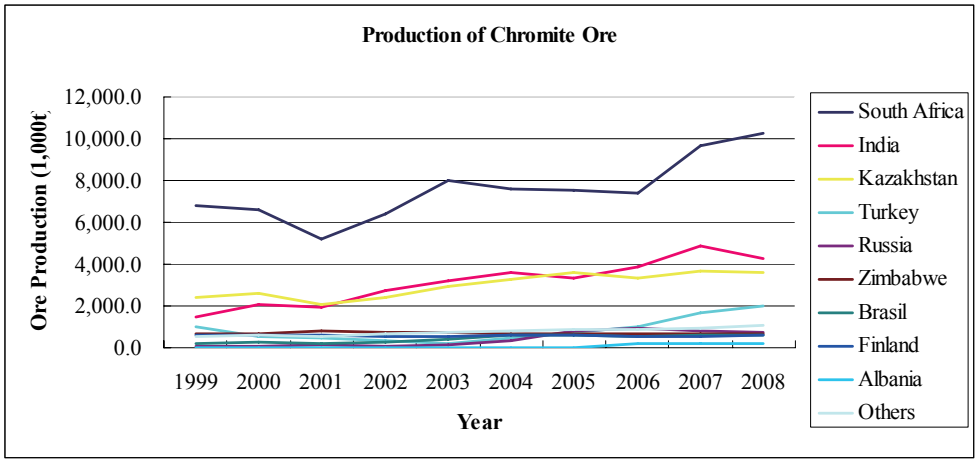


Figure 4.2.2 Annual production of chromite by major chromite producing country

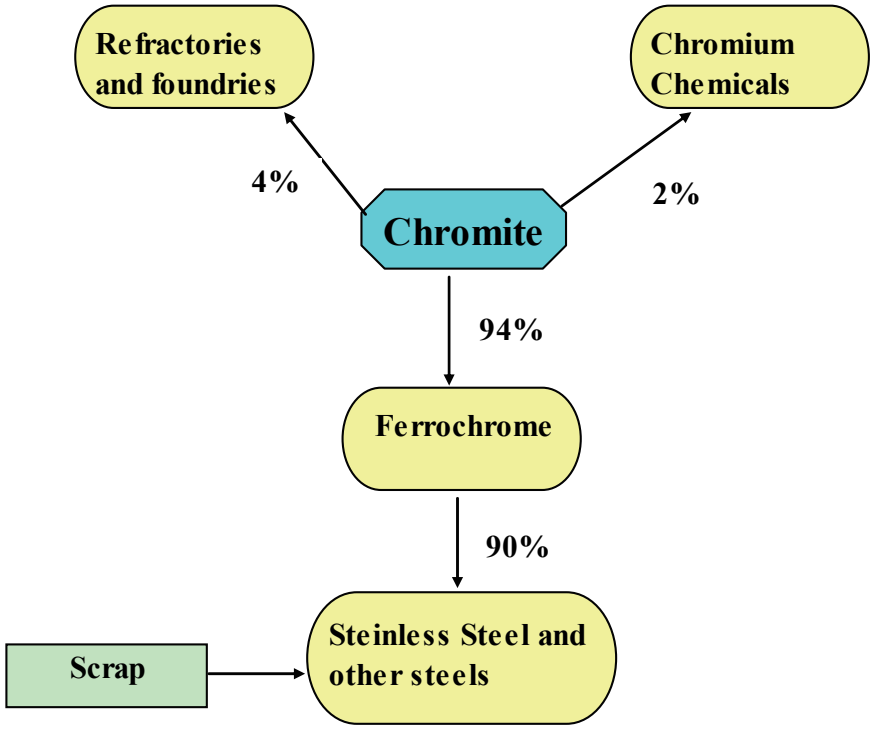
Chromite ($Fe^{2+}Cr_2O_4$) is a spinel group mineral. Fe^{2+} is substituted by Mg, and Cr_2 by Al and Fe^{3+}. Chromite ore is used for various purposes depending on contents of not only Cr but also contents of Mg, Al and Si. Pure chromite has 68% of Cr_2O_3 and 32% of FeO. Chromite has high melting point of 1,875℃ and it is not oxidized in air and water at normal temperature. It is mainly used for stainless steel and, depending on the grade of ore, it is used for coating refractory brick, super alloy and high-technology parts.

Chromium ore must meet certain specification to be sold in the world market. There are three classes of ore grade which do not solely depend on chromium contents, but rather its relationship with other associated elements such as Al_2O_3, SiO_2, FeO, etc. Table 4.2.7 shows general classes of chromite ore.

Table 4.2.7 Classification of chromite ore

Metallurgical grade	Cr_2O_3: greater than 48%
	Cr,Fe ratio: greater than 3:1
	Sulfur , Phosphor: less than 0.01%
Chemical grade	Cr_2O_3: greater than 45%
	Cr,Fe ratio: less than 2:1
	SiO_2, Al_2O_3, FeO, MgO, CaO Lesser amounts preferable
Refractory grade	Cr_2O_3: greater than 30%
	$Cr_2O_3 + Al_2O_3$: greater than 60%
	SiO_2: less than 5%

Most of chromite ore (more than 90%) is sent for production of ferrochrome and ferrochrome is used for producing stainless steel (Figure 4.2.3). After producing basic chromite from chromite ore, metal chromium with high chromium grade is produced. It is used for producing super alloy, magnetic materials and welding materials. Low grade chromite ore (refractory grade) is used for refractory brick and other refractory materials.



（source: International Chrome Association ）

Figure 4.2.3 End use of chromite

Until 1980s ferrochrome was mainly produced in the stainless steel producing countries such as Japan, US, Sweden and France, then ferrochrome production has been shifted to the chromite ore producing countries such as South Africa, India and Kazakhstan because of the advantages for supplying raw materials and lower costs of energy and labor. Ferrochrome is produced by electric furnace using coke as reducer and silica, limestone and others are used for flux. Other reducers such as carbon, silica and aluminum are also used. For high carbon ferrochrome (C: 6-8%), carbon is used as reducer

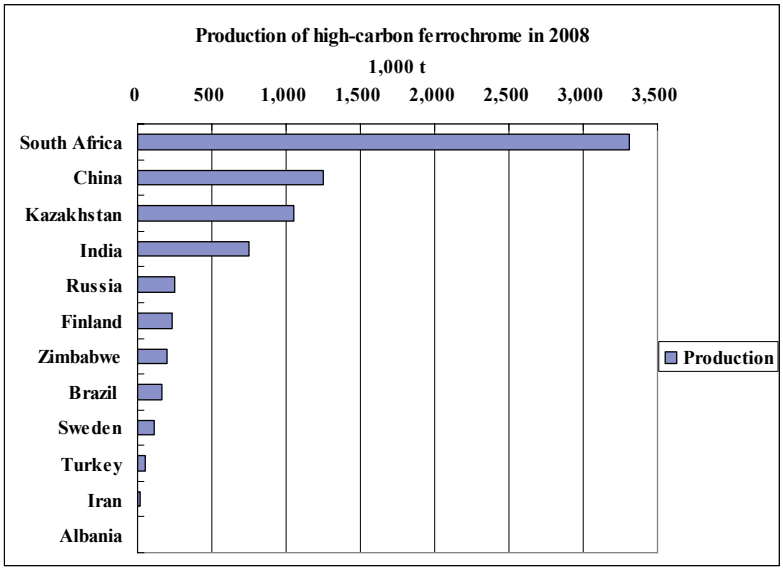
and it can be processed with higher productivity and lower cost. For low carbon ferrochrome (C 0.1% at maximum), silica is used for reducer. Metal chromium is produced by electrolytic separation or reduction by aluminium.

Productions of high carbon ferrochrome and low to medium carbon ferrochrome of each country are shown in Figure 4.2.4 and Figure 4.2.5, respectively. Countries of high production of high carbon ferrochrome are South Africa, China, Kazakhstan and India. All the countries other than China are major chromite producing countries. High carbon ferrochrome production of Albania in 2008 is approximately 8,000 tons. The country of the highest production of medium to low carbon ferrochrome is China. The medium to low carbon ferrochrome is produced even in the countries without production of chromite ore such as Germany and Japan.

High Carbone Ferrochrome

	Production
South Africa	3,310
China	1,250
Kazakhstan	1,054
India	750
Russia	250
Finland	234
Zimbabwe	200
Brazil	165
Sweden	110
Turkey	50
Iran	17
Albania	8
Total	7,381

(1,000t)



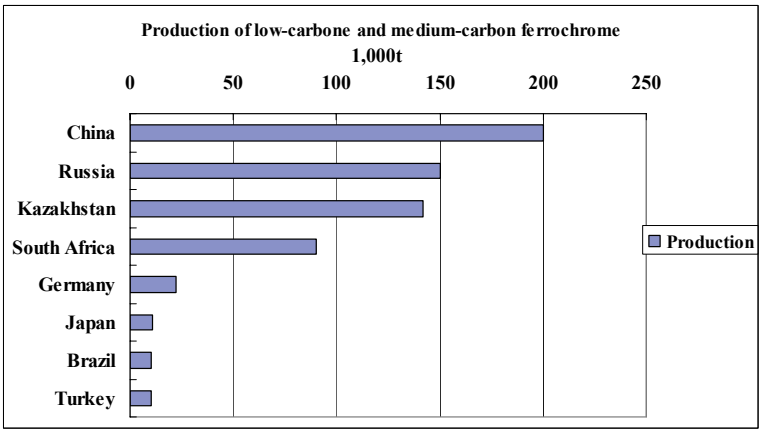
(source: International Conference on Data Analysis (ICDA))

Figure 4.2.4 Production of high carbon ferrochrome

Low-carbon and medium-carbon ferrochrome

	Production
China	200
Russia	150
Kazakhstan	142
South Africa	90
Germany	22
Japan	11
Brazil	10
Turkey	10
Total	635

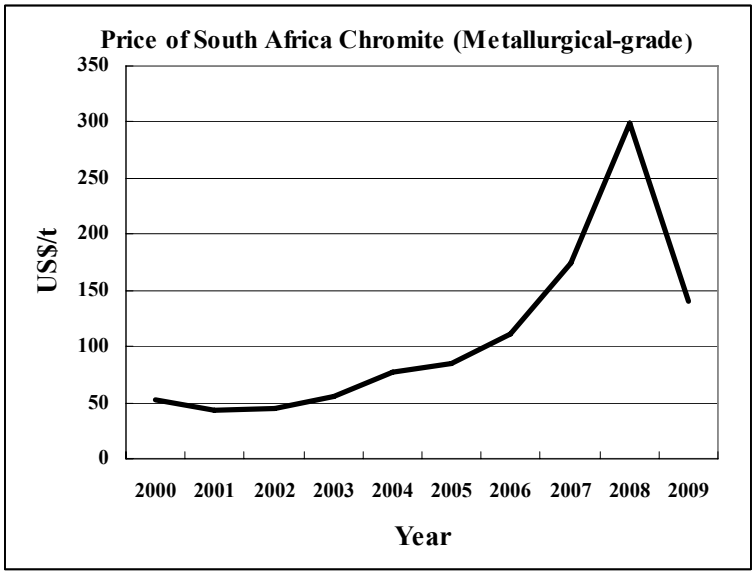
(1,000t)



(source: International Conference on Data Analysis (ICDA))

Figure 4.2.5 Production of medium to low carbon ferrochrome

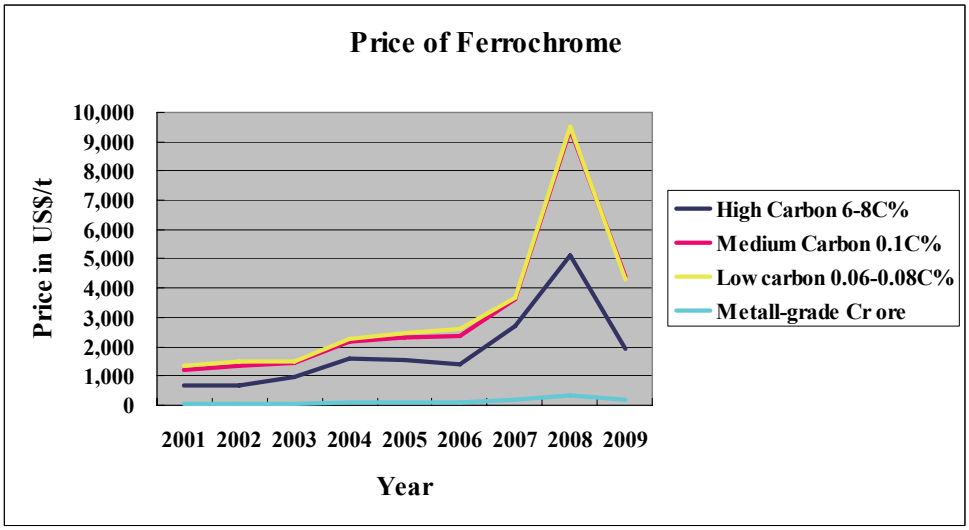
The price of chrome ore changes responding to the fluctuation of the world demand-supply relations of chromite ore (Figure 4.2.6). The price of chromite ore was very high in 2008, more than 300US$/t but it went down to 140US$/t on April 2009. The price is expected to gradually get higher in future.



(source: Industrial Minerals)

Figure 4.2.6 Price of chromite ore

Controlling the price of chromite ore, fluctuation of price of ferrochrome is similar to that of chrome ore with high price in 2008 (Figure 4.2.7). The price of low carbon (C:6-8%) ferrochrome and medium carbon (C:0.1%) ferrochrome show similar price and they are 1.5 times to twice as high as high carbon (C:6-8%) ferrochrome.

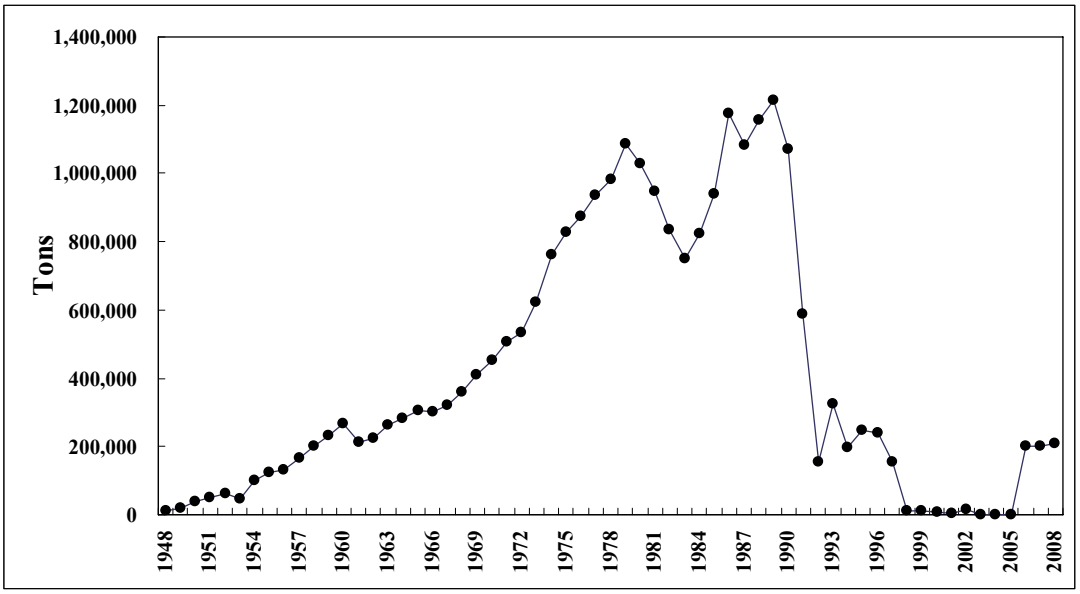


(source: Metal bulletin)

Figure 4.2.7 Price of ferrochrome

4.2.3 History of Chromite Production

During the period of occupation by Italy in 1940s, production of chromite was conducted in a few small mines and about 2,000 tons/year of chromite ore was produced. Then, in 1948, production of chromite was started in Bulqiza mine. During the period of planed economy in 1970s and 1980s, mineral exploration programs systematically conducted nation-wide led to findings of many ore deposits, subsequent development of mines and production of ore (Figure 4.2.8). The mining industry of chromite was operated by state company called ALB CHROME and production of chromite ore exceeded more than 1 million tons/year from late 1970s to 1989. During that period Albania was No.3 chromite producing country in the world after South Africa and the Soviet Union (Kazakhstan). At the end of communist regime in 1991, the production of chromite drastically dropped and a struggle with the privatization of mining industry continued. After 2000, introduction of foreign investment to the chromite mining started and annual production of chromite reached approximately 200,000 tons in 2006 and the production is gradually increasing.



(source: AKBN data)

Figure 4.2.8 Annual production of chromite ore

4.2.4 Present Situation of Chromite Mining

1) Present situation of mining

Recent (1995-2008) mining activities of chromite in each regions are summarized by year basis in Table 4.2.8. Among 162 mining permissions given for exploitation of the chromite ore in total from 1995 to 2008, 90 (56%) of them belong to Bulqize region and 32 (20%) of them belong to Tropoja region. These two regions are most active in chromite mining activities. From this total number of mining permissions in a periods of 1995-2008, 101 were issued in 1995-2004 period and 61 were issued in 2005-2008 period. The number of mining permissions issued during 2007 and 2008 is higher, respectively, 17and 25. This is because of the fact that demands of chromite ore increased and the chromite ore price in the world market in 2005 started to become higher. After the minimum production of chromite ore during difficult period with low price and low demands of 1999 to 2004, the production of chromite ore began to increase. The production of chromite ore reached to 200,000 tons/year in 2006 and the figure has been slightly increasing until now.

Table 4.2.8 Recent mining activities of chromite

No	Region	Permission 1995-2004	Permission 1995-2004	Permisions 1995-2008	Permission per year				Production per year			
					2005	2006	2007	2008	2005	2006	2007	2008
1	Korce		1	1			1			0	0	6,206
2	Pogradec	3	1	4				1		2,400	3,700	6,254
3	Librazhd	7	3	10	1	1	0	1		5,355	6,575	6,455
4	Bulqiza	54	36	90	7	6	6	17		163,451	150,730	156,280
5	Mat	7	3	10	2			1		9,020	9,976	9,500
6	Diber	1	1	2			1			50	2,400	300
7	Kukes	2	1	3				1		2,953	3,000	4,205
8	Has	5		5						12,388	15,280	8,189
9	Tropoja	20	12	32	1	1	8	2		5,854	7,110	9,715
10	Puke	2	1	3			1			110	1,000	0
11	Lezhee	1		1				1				
12	Shokoder		1	1				1				
	Total	102	60	162	11	8	17	25	162,772	201,581	199,771	207,104

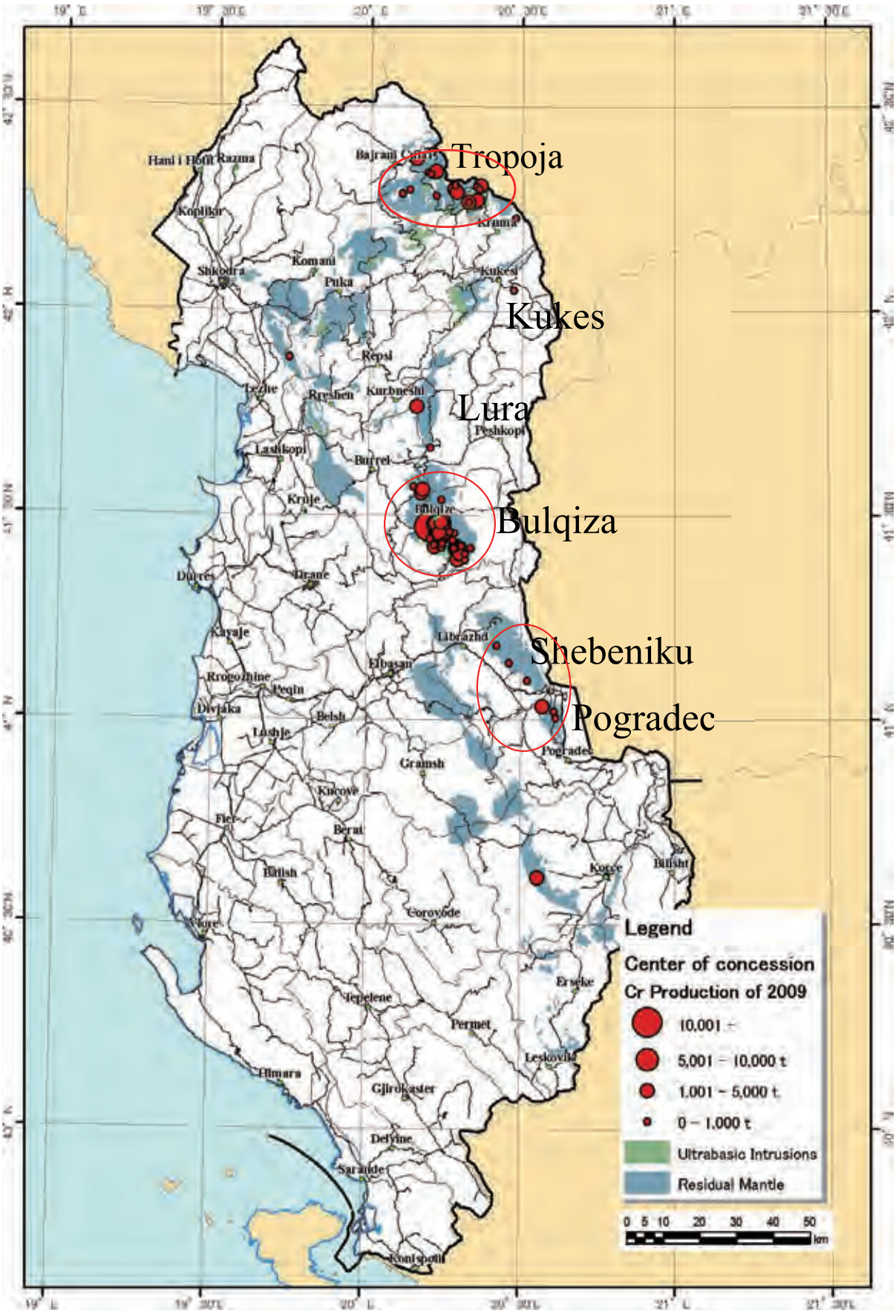
(source: AKBN data)

The exploitation licenses have been issued for chromite deposits of all ultramafic rock massifs, such as Shebenik-Pogradec massif, Bulqiza massif, except Kukes ultramafic massif and a part of Tropoja massif, where Kalimash and Vlahna mines are located. These two mines were planed to be opened for international tender to invite offer of the economically powerful foreign companies. In April 2010, the concession of Kalimash and Vlahna mines were awarded to a joint venture of Turkish and Chinese companies.

The currently operating chromite mines in Bulqiza massif are mainly Bulqiza mine and Batra mine and mining operations were conducted by Albanian Chrome (ACR) and many other small companies. The Albania Chrome is the largest mining company in Albania with 700 employees but most of the companies engaged in chromite mining are small scale with more or less 20 employees and operations of these companies are not continuous depending on prices and demand of chromite ore. The examples of these in Shebenik-Pogrdec massif are Katjel and Pojska mines.

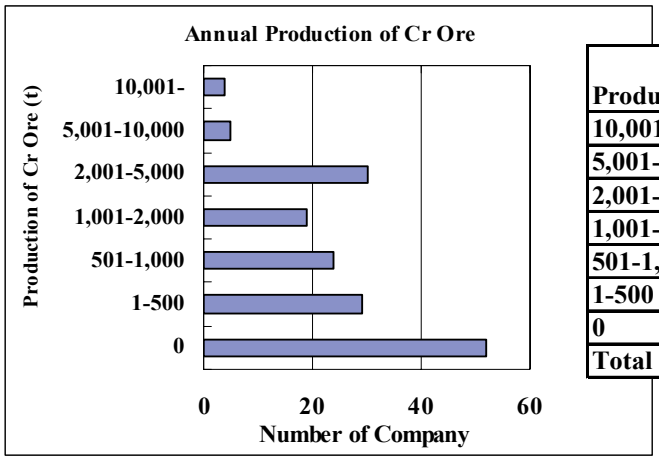
A distribution of mining concession of chromite classified by amount of production in 2009 is shown in Figure 4.2.9 and a histogram of Figure 4.2.10 shows classification of mine concession by production. The areas of production of chromite in Albania are concentrated in three areas, Tropoja-Kukes, Bulqiza, Shebeniku-Pogradec. At present, no significant mining activities are taking place in Kukes massif, however, Kalimash-Vlahna mines were awarded to a contractor, and production of chromite is expected in future. Among 163 mining concessions registered as of March 2010, 95% of them are conducting small scale operation with annual production of chromite ore less than 5,000 tons and only 4 mining concession have annual production of more than 10,000t. For number of employees, more than 90% of the mining concessions are small scale with less than 20 employees (Figure 4.2.11). Further, among these, 52 mining concessions claim no production in 2009 and most of concessions without production in 2009 claim no employee or less that 5 employees. Chromite mines of Albania are operated by a few large companies and many small companies.

Annual chromite ore productions in 2009 of each of Tropoja-Kukes, Bulqiza, Shebnik-Pogradec areas are shown in Table 4.2.9. Chromite ore of more than 10,000tons was produced from 1 concession in Tropoja-Kukes area and 3 concessions in Bulqiza area and most of the rest of concessions are small scale with annual production of less than 5,000 tons.



(source: METE)

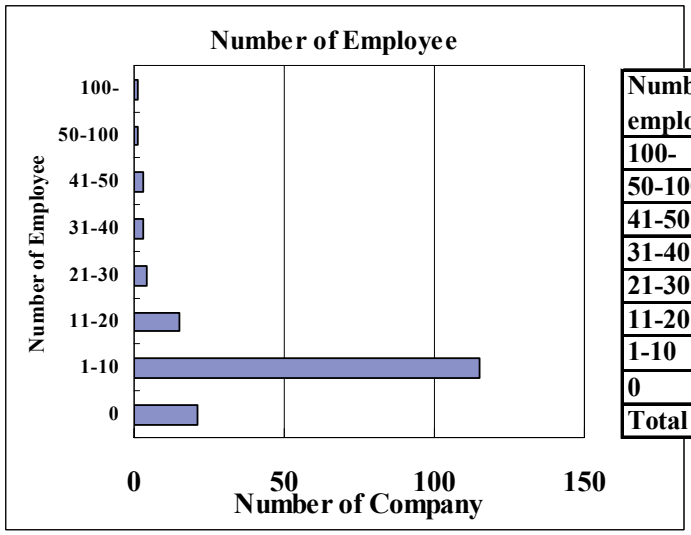
Figure 4.2.9 Distribution of chromite concession and annual production of chromite ore



Production	Number of company	(%)
10,001-	4	2.5
5,001-10,000	5	3.1
2,001-5,000	30	18.4
1,001-2,000	19	11.7
501-1,000	24	14.7
1-500	29	17.8
0	52	31.9
Total	163	100

(source: METE)

Figure 4.2.10 Classification of chromite concession by annual production of 2009



Number of employee	Number of company	(%)
100-	1	1
50-100	1	1
41-50	3	2
31-40	3	2
21-30	4	2
11-20	15	9
1-10	115	71
0	21	13
Total	163	100

(source METE, employee of 2009)

Figure 4.2.11 Classification of chromite mine by number of employee

Table 4.2.9 Classification of chromite mine by production

Tropoja-Kukes

Production of ore /company (t)	Number of company	Total production in 2009 (t)	Total production in 2008(t)	Geological resource (t)
0	22	0	992	59,907
1-5,000	24	33,394	13,672	330,978
5001-10,000	1	5,335	4,311	262,621
10,001-	1	11,170	4,205	180,000
Total	48	49,899	23,180	833,506

Bulqiza

Production of ore /company (t)	Number of company	Total production in 2009 (t)	Total production in 2008(t)	Geological resource (t)
0	23	0	8,400	167,243
1-5,000	68	110,643	76,783	1,772,025
5001-10,000	3	17,081	19,670	4,979,063
10,001-	3	105,637	68,191	0
Total	97	233,361	173,044	6,918,331

Shebeniku-Pogradec

Production of ore /company (t)	Number of company	Total production in 2009 (t)	Total production in 2008(t)	Geological resource (t)
0	5	0	4,042	7,800
1-5,000	9	7,133	10,873	31,263
5001-10,000	1	8,030	0	0
10,001-	0	0	0	0
Total	15	15,163	14,915	39,063

Grand Total	160	298,423	211,139	7,790,900

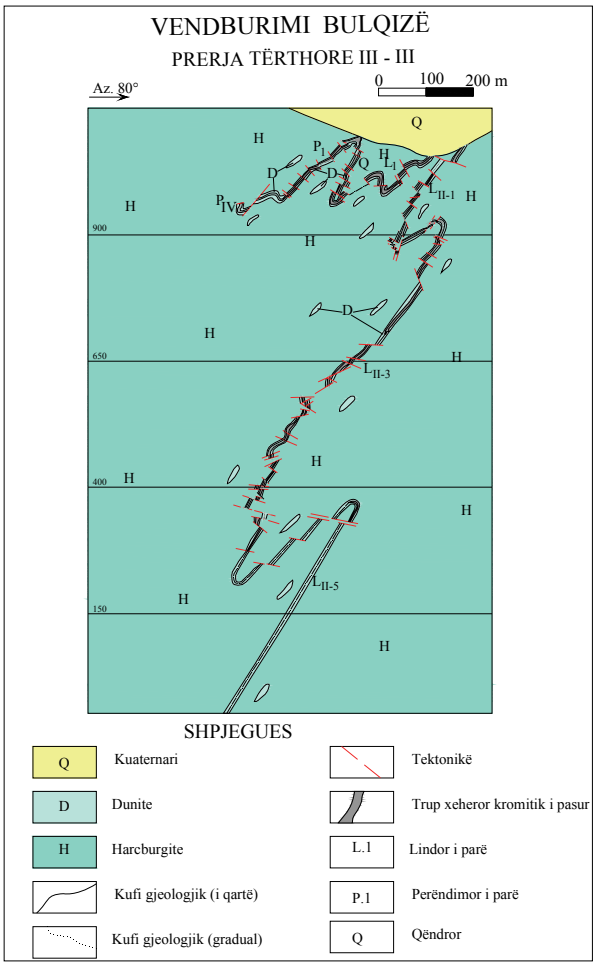
(source: METE)

2) Main chromite mines

The main chromite mines of Albania are Bulqiza mine and Batra mine in Bulqiza massif and Kalinash mine in Tropoja-Kukes massif.

(1) Bulqiza mine

The Bulqiza and Batra ore deposits are a continuous ore deposit and they are the biggest chrome deposit in Albania. The ore deposits extend north-west to south-east direction of 5,000 m long and 500-1,200 m in dipping direction with body thickness of 0.50 to 5-10 m (Figure 4.2.12). The mineralization occurs in hartzburgite-dunite sequence and the ore body is forming a part of the Bulqiza-Batra anticlinal structure. The ore body has a complicated structure cut by numerous faults and deformed by tectonic movements.



(source: AGS)

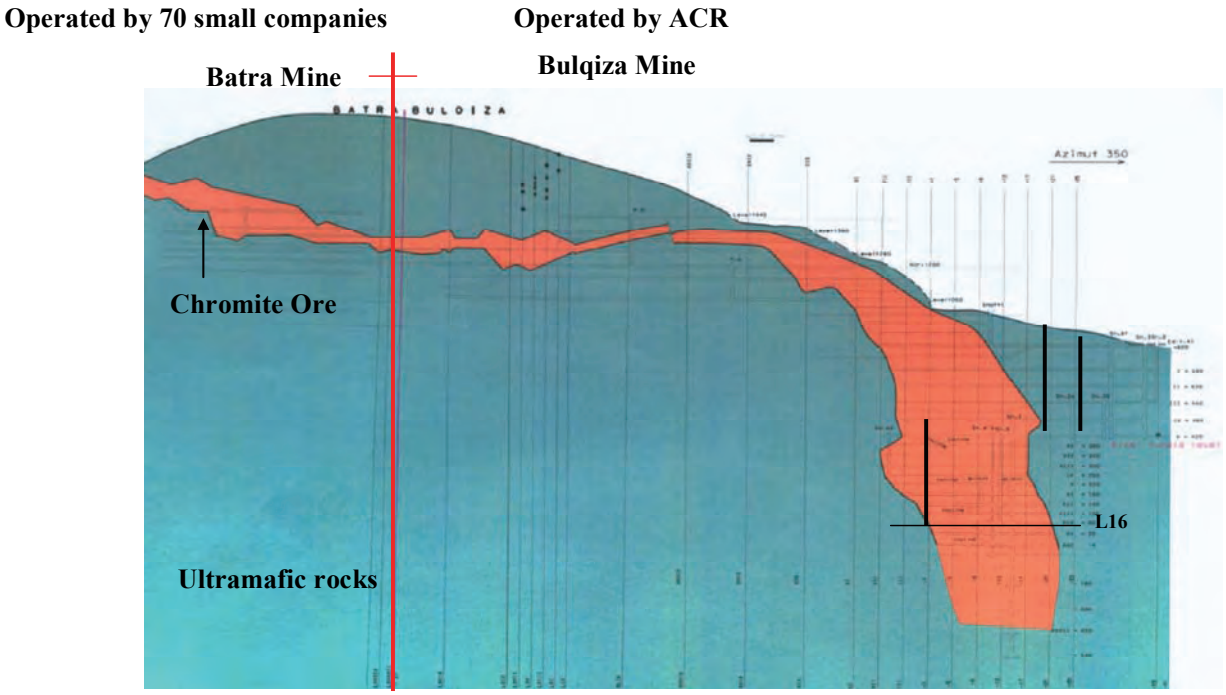
Figure 4.2.12 Cross section of Bulqiza ore body

Surface chromite exploitation in the Bulqiza mine was started in 1948 and underground exploitation started in 1949. In a period of 1948 to 2005, around 13 million tons of chromite ore was produced from Bulqiza mine. Since the ore resource of upper than Level 16 (-20m) was mostly mined out, the geological resource for all categories situated over level 16 is 60, 000 tons with 46.75 Cr_2O_3%. While, the ore resource of under the level 16 is 2,126,800 tons with 44.91Cr_2O_3%. The lowest level reached by drillings is -440m and thickness of discovered ore is 3.7 m with 39.99%Cr_2O_3.

The Bulqiza mine was operated by state owned company of ALB CHROME, and, then in 2001, mining license of the main part of Bulqiza main was obtained by DARFO (Italian company with joint venture with Austrian DCM DECO metal and Russian company Terwingo). During 2001 to 2007, DARFO was able to continue mining but no clear progress and improvement were attained for mining activities. Then in 2007, it was sold to Albanian Chrome (ACR).

In the Bulqiza mine ARC are currently working at the level 16, approximately 800m below the main gallery (Figure 4.2.13). Among the mined ore, 75% of it is high grade. For the recent 5 years, production has been 7,000 tons/month and 80,000 tons/year. The Albanian Chrome has started to sink a new shaft, Shaft No.7. The new shaft will be made from Level 16 to reach Level 24. After the completion of the work, production of chromite ore will be increased from 80,000 tons/year to 230,000 - 250,000 tons/year. The total cost of the project is estimated to be 30 to 35 million Euros. The project was actually started on September 1, 2009 and Albanian and Russian will work for this shaft for 2.5 to 3 years to complete the shaft.

One of the problems of the Bulqiza mine is mining operation of small companies. Twenty four small mining companies, each of which has workers of only more or less 10 workers, are working legally close to working area of Albanian Chrome, even on the same gallery. Although some of mining engineer working there are experienced, knowledge of mining engineering for many of workers seems to be poor and dangerous mining operation seem to be conducted by them. The Batra mine is operated by 70 of these small companies.



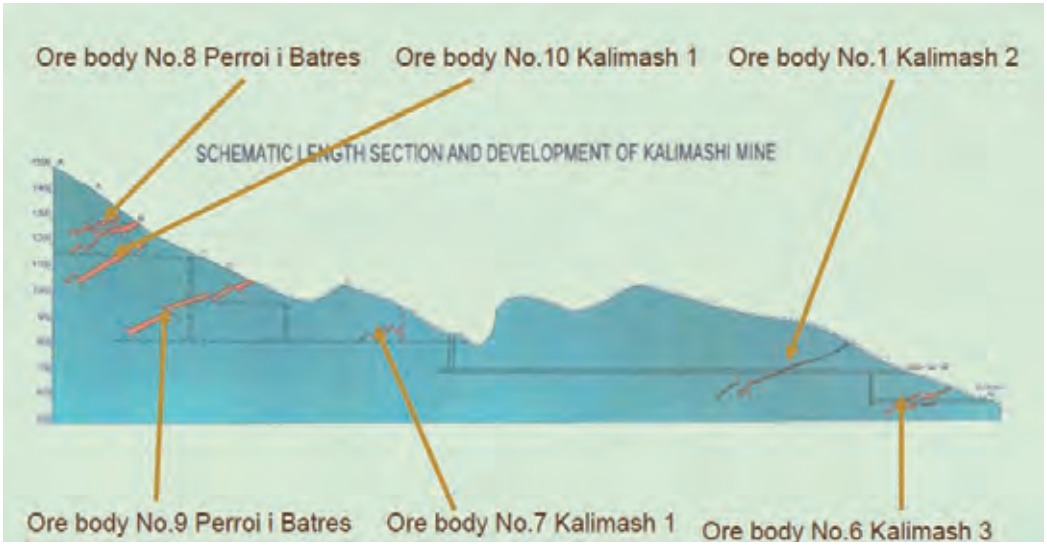
(source: AKBN)

Figure 4.2.13 Bulqiza and Batra mines

(2) Kalimash mine

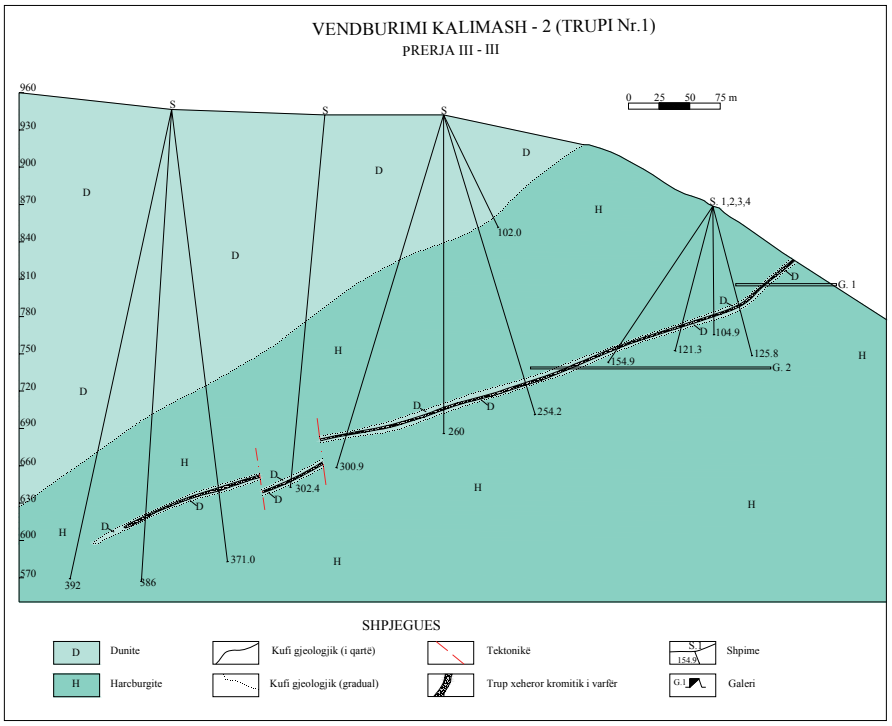
Kalimash mine, located in Kukes ultramafic massif, consists of Kalimash1, Kalimash2, Kalimash3 and Perroi i Batres mines and mining operation of it was started in 1978 (Figure 4.2.14). During the period of 1978 to 1997, chromite ore of 1.65 million tons was produced from these four mines before they were closed in 2000. Because of a slightly lower grade, approximately 20Cr2O3%, of chromite ore from these mines, crude ore was sent to Kalimash dressing plant to produce concentrates of 45-50 Cr2O3% before exporting. Although ore deposits of the Kalimash mine, with thickness of 1.5 to 2.0m, is cut by some of faults, it generally shows simple monoclinic structure dipping 20 to 35 degree (Figure 4.2.15). After closing of the mine in 2000, the main part of the mine was kept for international tender, not open to mining concession for Albanian company.

An international tender for mining concession was held including both of Kalimash mine of Kukes massif and Vlahna mine of Tropoja massif and the mining concession was give to a joint venture of Kurum Energy, Resources and Metallurgy (Turkey) and Sichuan Jiannanchun Group (China) in April 2010. According to the information of AKBN, mineral resource of a total of four mines of Kalimash is 5.1 million tons (18-23%Cr2O3) and higher grade of ore is expected in the depth. Although production of Vlahna mine during a period of 1986 to 1996 was 45,000 tons, mineral resource of 2.56 million tons （29.2Cr2O3%） is estimated. According to the contract between the government and the Join Venture, 210,000 tons/year of chromite ore must be produced and two concentration plants in Kalimash and Golaj mush be completed within 2 years. Further, smelting plan must be completed to produce 60,000 tons/year of ferrochrome within three years.



(source: AKBN)

Figure 4.2.14 Kalimash mine



(source: AGS)

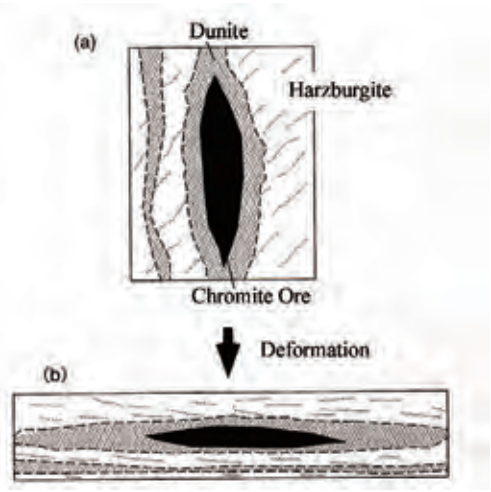
Figure 4.2.15 Cross section of Kalimash2 ore body

3) Situation of exploration

(1) Geological situation

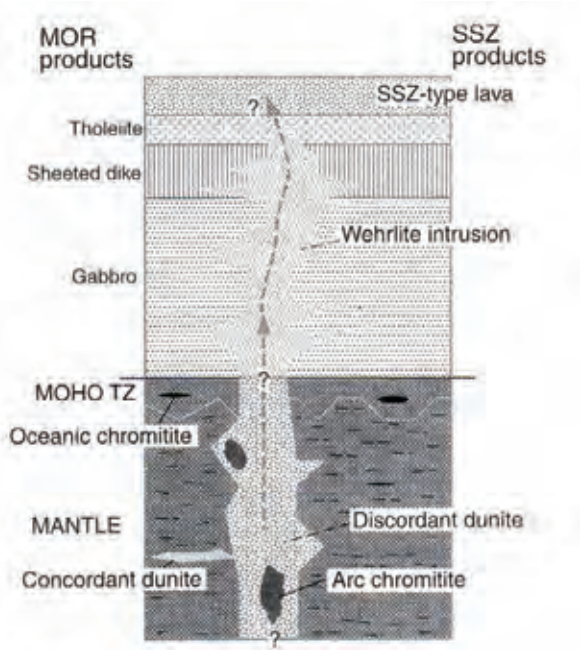
Ophiolite sequence is a fragment of oceanic crust and upper mantle thrust over and emplaced on the continental margin. Strong deformation of ultramafic rocks including podiform chromite deposits is attributed to those tectonic movements (Figure 4.2.16). The podiform chromite deposits of ophiolite sequence are mostly found in the ultramafic rocks of the mantle near transitional zone between crust and mantle and rarely found deep in the mantle sequence. The podiform chromite characteristically occurs surrounded by dunite in the harzburgite suggesting a close genetic relation between dunite and

chormite ore (Figure 4.2.17). The dunite rarely occurs discordantly to surrounding harzburgite, but dunite and included chromite ore deposit mostly occur concordantly to surrounding harzburgite. It is suggested from these aspects that dunite with chromite ore was originally discordant to the surrounding harzburgite but then it has become concordant during the deformation by the tectonic movement.



(Arai, 2003)

Figure 4.2.16 Occurrence of podiform chromite ore



(Arai, 2003)

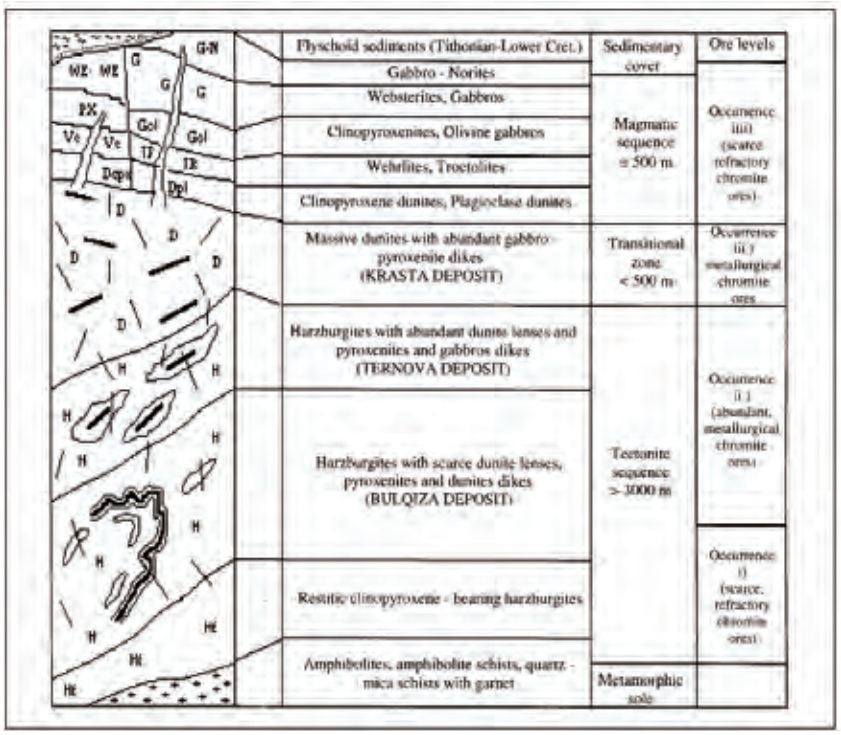
Figure 4.2.17 Chromite ore deposits in ophiolite sequence rocks

The Bulqiza ultramafic massif was stratigraphically classified by rock phases as shown in Table 4.2.10 and Figure 4.2.18 (Beqiraj et al, 2000). The chromite deposits of economical value occur only in transitional zone of Unit iii and middle to upper tectonite sequence of Unit ii and other than these zones no significant chromite mineralization is found.

Table 4.2.10 Lithological sequence of Bulqiza massif

Sequence	Occurrence of chromite	Geological unit	Chromite Ore	Ore deposits
Magmatic Sequence	iiii	Lower most part of magmatic sequence	Scarce refractory chromite	
Transitional Zone	iii	Layered chromite bearing dunite Transitional zone	Metallurgical chromite	Krast Deposit
Harzburgite Tectonite	ii	Dunite lens-bearing harzburgite middle-upper tectonite sequence	Abundant metallurgical chromite	Ternova Deposit Bulqiza Deposit
	i	Basal harzburgite Lower tectonite sequence	Scarce refractory chromite	

(source: Beqirai et al, 2000)



(Beqiraj et al, 2000)

Figure 4.2.18 Stratigraphic sequence of Bulqiza massif

(2) Exploration activities

The main exploration activities are conducted by Canadian and Australian junior companies, respectively in Bulqiza massif and Tropoja massif. Other than these, a small scale exploration is conducted in operating mines and at the vicinity of known ore deposits by Albanian companies.

a. Bulqiza massif

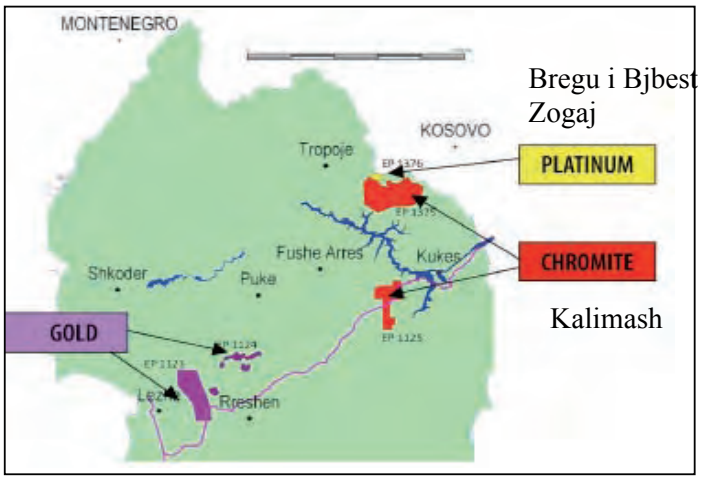
Among the chromite exploration projects in Albania a junior company, Empire Mining (Canada), is currently most vigorously working in the Bulqiza area. The Empire Mining obtained prospecting license in the area of 134km^2 covering Bulqiza ultramafic massif including Bulqiza mine and Batra mine areas in May 2008 (Empire Mining and EC Terra). Further, within the prospecting licensed area, the Empire Mining obtained four areas of exploration license in January 2009, one of which is covering 35km^2 including Bulqiza and Batra mines areas (Figure 4.2.19). Based on their own geological ideas of considering a importance of thrust tectonics for formation of geological structure of the Bulqiza area (Hoxha, 2007), they made drilling plan to start drilling. The drilling was started in April, 2010.

(source: Empire Mining and EC Terra, 2009)

Figure 4.2.19 Exploration area of Empire Mining

b. Tropoja-Kukes massif

Jab Resources (Australia) has three exploration license areas in Tropoja-Kukes massif. They are Kalimash (chromite), over the area surrounding Kalimash mine, Bregu i Bjbest (chromite and Platinum) and Zogai (chromite) (Figure 4.2.20).



(source: Jab Resources)

Figure 4.2.20 Exploration areas of Jab Resources

Kalimash Exploration license area is located surrounding Kalimash mine. In the area Jab Resources has conducted surface geological survey, compilation of existing information, trench survey and reverse circulation drilling of 57 holes (Total 3,834m) (Mathison Geoscience Pty. LTD. 2010). The results of survey suggested a total of inferred mineral resource of 6.72 million tons at 4.36Cr2O3% in Target 1 and Target 2, both of which respectively located in the west and in the east of the Kalinash mine. Mineral processing test showed that, using samples of head grade at 10Cr2O3%, it was possible to produce concentrates of 40Cr2O3% at recovery of 77%. For future work, infill diamond core drilling, reverse circulation drilling, mineral processing and metallurgical tests are planned.

Bregu i Bjbest area is located close to Kosovo border in Tropoja massif. In the area, PGE (Platinum Group Elements) mineralization in addition to chromite mineralization has been known by the survey of the state owned exploration company in the past. Boshnjaku and Kulici (2002), from the Geological Research Institute (GRI) of Albania, describe PGE mineralized bodies of chromite orthopyroxenite with strike lengths up to 200m, down dip extents of 20 to 40m and thicknesses from 1 to 10m with PGE grade between 1 and 7ppm with sporadic assays up to 27ppm Pt. Jab Resources conducted surface geological survey, sampling of mineralized zone, compiling of existing data, preliminary mineralogical analysis of PGE bearing chromite mineralization. Jab Resources is expecting that there is a good chance that PGE mineralization of a sufficient grade and quality to be mineable will be located by detailed modern exploration of this area (Mathison Geoscience Pty. LTD., 2010). For future work, mapping and sampling of existing trench and mineral showings and infill reverse circulation drilling are planned for understanding PGE mineralization and finding other PGE mineralization layer.

Zogai area is located in the area immediate south of Bregu i Bjbest. In the area there are Zogai mine (mineral resources: 1.238 million tons, operated until 2000) and other relatively large mineral deposits with mineral resources of around 100,000 tons. Since existing mines are specifically excluded in exploration license of Albania, the targets for JAB Resources exploration program are to delineate a larger deposit around a poorly explored small deposit or to locate a shallowly buried concealed deposit. The exploration program is still at preliminary stage and the works so far conducted are geological reconnaissance survey and sampling of old workings and assaying.

4.2.5 Material Flow

As the production of chromite ore drastically increased in 1970s and 1980s, a integrated system of chromite mining industry, continuous process of mining-dressing-smelting, in Albania was considered and concentration plants were established in Bulqiza, Batra, Kalimash and smelting plants were established in Burrel and Elbasan (Figure 4.2.21).

The Bulqiza concentration plant with crude ore treating capacity of 240,000 tons/year is operational now and production capacity of chromite concentrates (48-50%Cr2O3) is 120,000 tons/year. Concentration plant of Kalimash with chromite concentrates producing capacity of 80,000 tons/year is now dormant. Other than these, there are pre-dressing treatment plants in other places in addition to Bulqiza and Batra and gravitation concentration of granule ore is conducted.

There are two smelting plants, one in Elbasan and the other in Burrel, in Albania. The Burrel smelting plant was operated from 1979 to 2000 and 460,000 tons of ferrochrome was produced from 1.4 million tons of crude ore and concentrates. The Burrel smelting plant is, now, owned by Albanian Chrome under the contract of ROT (Rehabilitation-Operation-Transfer) and it is left untouched without any rehabilitation work.

The production of ferrochrome using one furnace in Elbasan smelting plant was started in 1989 by the state company ALB CHROME. By operation of ALB CHROME during a period of 1990 to 2000, 450,000 tons of chromite ore was processed and 143,000 tons of ferrochrome was produced. Then, the Elbasan Plant was transferred to Italian company DARFO. The plant is currently operated by Albanian Chrome and it has not reached to its full operation as of June 2010. The Elbasan smelting

plant had three electric furnaces for high carbon ferrochrome and now two of them have been changed to furnace for low carbon ferrochrome by Albanian Chrome. The Albanian Chrome is trying to shift production from only high carbon ferrochrome to low carbon ferrochrome in addition to high carbon ferrochrome. The target of the Albania Chrome is to produce low carbon ferrochrome at an amount of 5% of the world market (600,000 tons/year).

In the past, concentration plants were operational in Kalimash, Bulqiza and Batra, and low grade chromite ore of Bulqiza and Batra mines were processed to produce concentrates and then ferrochrome was produced in smelting plants of Elbasan and Burrel. But now currently operating concentration plants are Bulqiza and Batra, and Elbasan is the only operational smelting plant (Figure 4.2.22). The low grade chromite ore of Tropoja-Kukes area is sent to concentration plant of Kosovo.

Material Flow of Chrome Before 1994

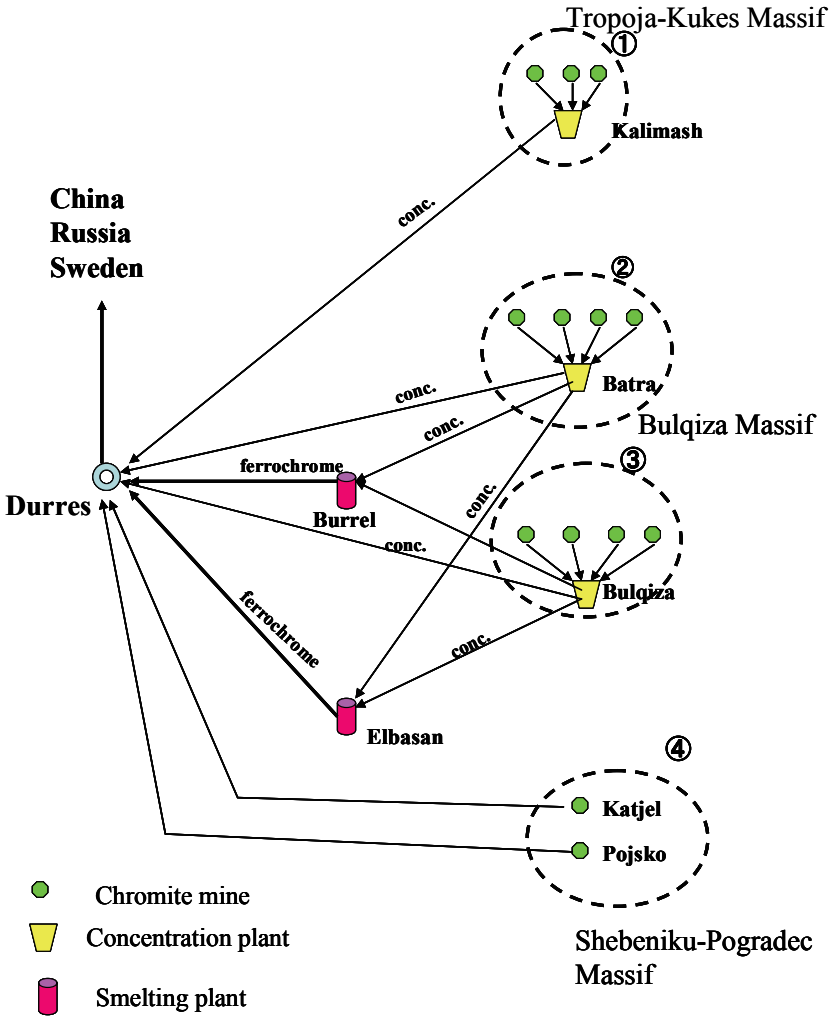


Figure 4.2.21 Material flow before 1994

Although it is difficult to know the exact amount of export, export amounts of chromite ore, concentrates and ferrochrome from Durres port are shown based on the information of AKBN in Table 4.2.11. Chromite ore and concentrates are mainly exported to China and exported amount in 2009 are, respectively, 240,000tons and 13,000tons. All ferrochrome produced in the Elbasan smelting plant are considered to be exported from Durres port and 5,288 tons of high carbon ferrochrome was exported in addition to 520 tons of low carbon ferrochrome in 2009.

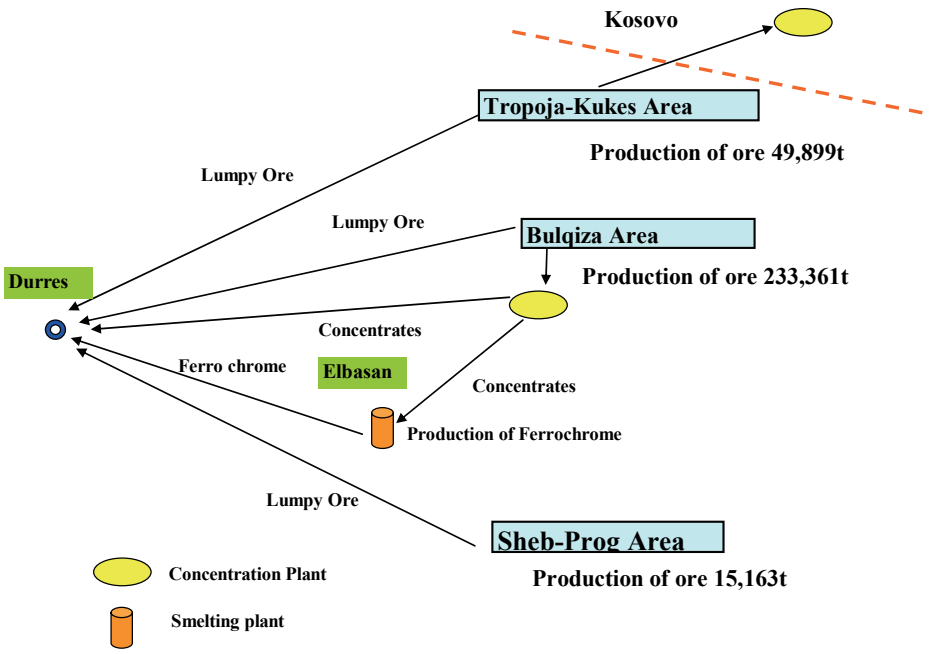


Figure 4.2.22 Material flow of present

Table4.2.11 Export of chromite ore, concentrates and ferrochrome from Durres port

	2006	2007	2008	2009
Chrome ore (t)	184,100	343,019	194,207	243,024
Chrome concentrate (t)	19,761	17,252	9,650	13,067
High Carbon ferrochrome (t)	17,074	327	8,392	5,288
Low Carbon ferrochrome (t)	-	-	-	520

(source: AKBN)

4.2.6 Problems Existing in Chromite Mining

Chromite mining had been playing most important role in the mining industry of Albania and economically contributed much to the government finance in the past. Although chromite mining was declined during the period from early 1990s to early 2000s, it now shows sign of gradual regaining by introduction of foreign investment. The scale of chromite mine in Albania is generally small but optimal use of these small scale mines abundantly distributed in Albania can greatly contribute to economy of Albania. The problems that chromite mining is currently facing are given below.

1) Situation of mining operation

Chromite mines of Albania are operated by a few of relatively large scale companies and many small companies. Albanian Chrome, operating in Bulqiz mine, is the only company with number of employees more than 100 and most of the rest of companies engaged in chromite mining are mostly small with number of employee around 10. For the annual production of chromite ore, only 4 companies exceed 10,000 tons and most of the companies have annual production of few thousands tons. Particularly in Bulqiza mine, mining operations of many small companies are conducted close to the workings of Albanian Chrome. The concession areas of small companies are distributed closely or horizontally overlap, being occupied by different companies in different level of galleries (Figure 4.2.23).

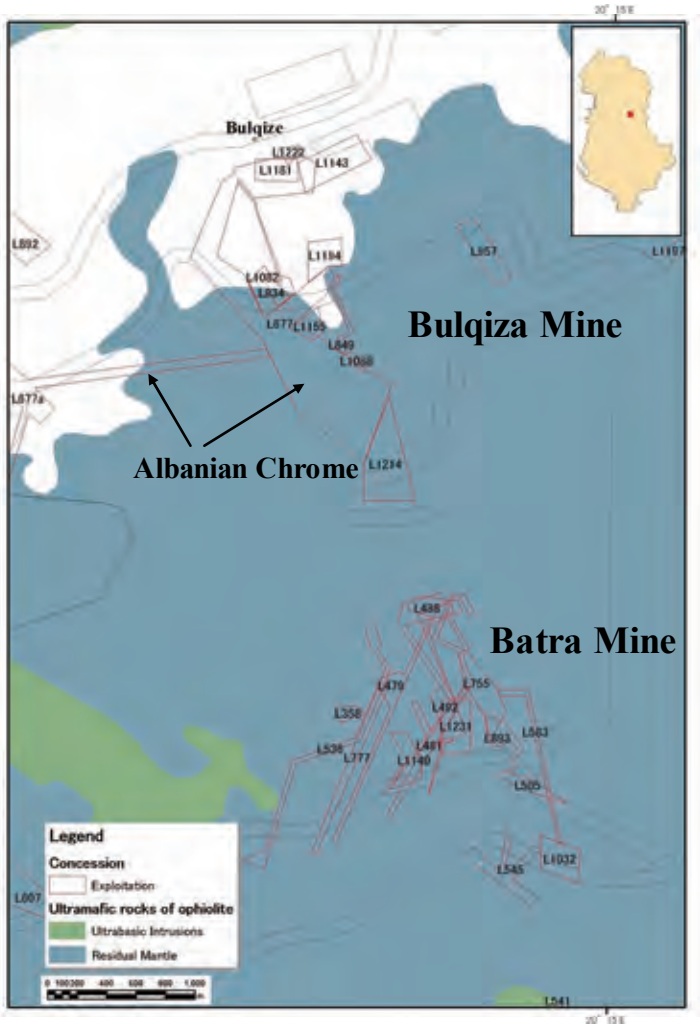


Figure 4.2.23 Concession map of Bulqiz and Batra mines

The mining operations of small companies are not continuous because they are strongly affected by price and demand of chromite. Further many of their operations conducted disregarding the safety regulations. But it is necessary for them to continue exploitation activities in line with chromite market in the world.

Based on Balallbashi (2009), situation of chromite mining operation of small companies with number of employees about 10 to 30 in Batra and Bulqiza areas are summarized in Table 4.2.12. These companies with number of employees from 7 to 38 are medium to small scale chromite companies in Albania and their annual productions of chromite ore are few thousand tons. Most of chromite ore is considered to be exported from Durres port. Because the selling price of chromite ore went down from 300US$ in 2008 to 125US$ in 2009, some of the companies reduced production in 2009. The mining cost of chromite ore in each companies ranges from 60US$/t to 120US$/t and, in addition to this, 30US/t is necessary for transportation to Durres port and expenditure for exportation. If the selling price of chromite ore is 125US/t the same as 2009, it is difficult for mine owners to get benefit. If they want to get more benefit from selling chromite ore, they must wait until chromite ore price goes up.

The chromite mining operation of small companies has many problems related to management of concession, mining operations, safety and others. These problems of mining operation of small companies are summarized based on Bakallbashi (2009) together with information collected by this study (Table 4.2.13). For supporting chromite mining operation of small companies to continue, these problems must be solved.

Table 4.2.12 Situation of chromite mining operation by medium to small companies

	Name of Company	Licence Number	Number of Employee	Production in 2008 (t)	Grade of ore Cr2O3 %	Amoount of Sold (t) in 2008	Export (selling) Price per ton	Production in 2009 (t)	Grade of ore Cr2O3%	Amoount of Sold (t) in 2009	Export (selling) Price per ton	Cost of Extraction Leke/ton	Transportation and expenditure at Durres per ton
Bullqiza	Klevi Brisk sh.p.k.	1163	10					600	42		125 USD%	60 USD	30 USD
	Name uidentified			0				0					
	Egi-K sh.p.k	1088 1155						4,100 2,106	40-41			80 USD	30 USD
	Isaku sh.p.k	1214	12	1,000		0		2,200				120 USD	
	Runja sh.p.k.	1082	15	1,000	40	0		1,000	40			60 USD	30 USD
Batra	11 Heronjte Batra	755	38	7,000	36-40	6,451	300 USD	6,481	36-38			70 USD	30 USD
	Klosi sh.p.k.	488	28	5,000	36	4,800	250 USD	5,400	36	500	120 USD	110 USD	
	Neli sh.p.k.	893	7	6,000	38			5,000				60 USD	
	Ateani sh.p.k	405	25	8,000	35-36	4,000	250 USD	3,000	35-36	2,000	123 USD	80 USD	30 USD
	Herbi sh.p.k.	492	33	6,000	40-41	2,600	300 USD	4,000	40-41			100 USD	30 USD
	Alba-Canaj sh.p.k.	481	38	7,000	41	4,000	350 USD	5,200	41	2,000	125 USD	100 USD	
	Kurti sh.p.k	545	9	1,800	30-38	1,800	370 USD	880	30-38			80 USD	35 USD
	Keisi sh.p.k.	777	20	2,400	39			650	39	500	123 USD		100 USD
Ternova	Ternova 2000	579	18	2,000	38	4,000	340 USD	1,200	38			80 USD	30 USD
Theken	Albanisa. Sh.p.k.	475	10	6,000	36-38	4,000	200 USD	2,285	36-38			80 USD	30 USD
	Koka sh.p.k.	775	7	1,200	42	0		4,800	42			80 USD	30 USD
	Koka sh.p.k.	1024	8	800	44	0		400	44				
	Gjoni sh.p.k.	1326	12	1,500	41-42	1,500	140 USD	1,200			140 USD		
	Ateani sh.p.k.	458	14										
	Ervini sh.p.k	489		1,800	38-40			2,100	38-40	1,000	170 USD	120 USD	30 USD
	Bledi sh. P.k.	478	18	2,000	40-41	1,000	130 USD	2,900	40-41				120 USD
Fushe Lope	Alba-Co sh.p.k.	548	11	600	43-44	270	512 USD	2,041	43	800	135 USD	120 USD	30 USD

（After Bakallbashi(2009) and METE）

Table 4.2.13 Problems of chromite mining operation of small companies

Management of concession	There are many concessions with no production and no employee or only few. It is not clear whether mine owner has intention of starting exploitation.
	Particularly in Bulqiza mine, each concession area is distributed closely or horizontally overlaps. Exploitation work is conducted without documentation disregarding agreement or regulations, and work of each concession is conducted without discussion of schedule among adjacent companies.
	Exploitation permits for waste and tailings dumps are issued without technical consideration and risks to the people around dumps are disregarded.
Problems of mining operation	Most of work processes, such as opening of mine workings, exploitation work, transportation and preliminary processing work, are conducted inefficiently by manual process.
	Exploitation is conducted without knowing geological-mining information of past.
	There is no technical disciplining for mining works such as opening galley and exploitation of chromite ore. Even remaining pillars of the past operation are exploited without considering safety.
	No technical and scientific work has been done for processing of poor chromite ores. Poor knowledge in processing including hand picking.
Problems in management	Mining operation is strongly affected by price of chromite ore and continuous operation can be conducted.
	There is no trust in banks' willingness to give out loans for investing in opening mine workings or setting up concentration plant.
Problems of safety	There are many galleys, mine workings and facilities which do not comply with technical safety regulation.
	There is no mine rescue teams organized in regional level.
Training for new workers	There is no training system for new workers.

2) Establishing integrated production system

Since chromite ore is heavy with high specific gravity, it is disadvantageous to export chromite ore because of high transportation cost. Further, developed countries, such as Japan and Germany, only import ferrochrome after smelting chromite ore in chromite ore producing countries (South Africa, Kazakhstan and other countries) with low cost of electricity and labor. In 2009, Albania exported 243, 000 tons of chromite ore and only 6,000tons of ferrochrome including both of high carbon and low carbon. For making best use of Albanian chromite resources for benefit of Albania, it is better to export value added material of ferrochrome than chromite ore. For this, additional smelting plants and concentration plants are necessary.

3) Assurance of chromite reserves for future

For sustainable development of chromite mining of Albania, it is necessary to assure mineable reserves of chromite ore for future. According to AGS information, chromite resources of 32.8 million tons ($B+C_1+C_2$) is repotted to exist in Albania. A total of chromite resource declared by each of concession holder in 2009 is 7.79 million tons and this amount of resource will be depleted in 25 years if production of chromite ore continues at 300,000 tons/year, the same production rate as present. But these values are mineral resources and they are not minable reserves. It is, therefore, necessary to obtain more precisely the amount of mineral reserves for future plan of exploitation of chromite ore. At present all the exploitation activities in Albania are conducted in the mines developed by state company before 1990. By using abundant geological data accumulated by the state company, it is necessary to conduct exploration program to find new deposits for development of new mines.

4.2.7 Strategy for Development of Chromite Mining

The purpose of the strategy is to make best use of chromite resources existed in Albania for the benefit of the country and people living there. For this, mining operation by coordination of few big companies and many small companies by playing each role is necessary for increasing production and continuous operation. Further, to increase the benefit from chromite resources, it is necessary to produce value added materials from chromite ore for exportation. It is, therefore, necessary to establish an integrated system of chromite production in Albania. For sustainable development of chromite mining, it is necessary to assure ore reserves and increase their value.

1) Coordination of large companies and small companies

Chromite mining in Albania is conducted by two clearly different types of company. The one is large company by foreign investment, such as Albanian Chrome operating in the Bulqiza mine and JV of Turkey and China companies which will start operation soon in Kalimash and Vlahna mines, and the other is many medium to small scale Albanian companies operating in many places. For further discussion, these two types of companies are separately treated in the report. Although there are relatively large mines such as Bulqiza mine in Albania, most of the mines and ore deposits are small with mineral resources of less than 500,000 tons. These small mines and ore deposits are never considered by big foreign companies for investment. Further, in big mines operated by state company in the past, such as Bulqiza-Batra mine, some high grade chromite ores remain untouched and they are being exploited by small companies now. To make best use of these chromite resources of small mines and remaining ores in big mines, exploitation work can only be conducted by small companies. Since the mining activities of small companies are economically, socially, strongly connected to local community, these mining activities can not be disregarded for maintaining stability of local community. It is, therefore, suggested that chromite mining of Albania should be developed by the coordination of large company with foreign investment and other small local companies by playing each role.

As mentioned in the previous section, there are many problems for small scale mining operation of small companies and suggestions for solving these problems are given below.

(1) Intensify monitoring of concession by AKBN

Among 163 concessions of chromite exploitation, 53 of them show no production in 2009. Further, these concessions reported only few employees or no employee and most of them reported no investment in 2009. It is doubtful that the owners of these concessions have an intension of further exploitation activities. The intension of further exploitation activities in future of these concessions should be confirmed from the owner through monitoring activities of the concessions, conducted by AKBN twice a year. If no exploitation activities are planed in future, strict action should be taken A task force was organized in May 2010 by METE to regulate illegal and no-license exploitation activities in Bulqiza area and 7 licenses were suspended. Since dormant exploitation license prevents ambitious new comers to start mining activities, strict action should be taken by AKBN to suspend unnecessary licenses. Particularly, in Bulqiza mine where many small companies conduct mining activities close to each other, it is necessary for AKBN and DSRMI to give enough guidance to them for preventing accidents and the submission of work plan by each mining company to AKBN should be mandatory.

During the mining operation, it is necessary for AKBN and DSRMI to patrol mine workings to check whether mining operation are conducted in compliance with technical and safety regulations.

(2) Establishing an association of small companies

Considering future exploitation activities of small companies, it is necessary to establish associations with cooperative function. Chromite ore is produced mainly from three separate areas of Tropoja-

Kukes, Bulqiza and Shebeniku-Pogradec. Considering these areas, a national level association should be established for sharing equipments and facilities, countering the fluctuation of chromite ore price, assisting finances for exploration programs and upgrading mining facilities. By this way, it is necessary to establish the chromite mining industry of Albania in line with world market.

In Chile, the national mining company ENAMI (Empresa Nacional de Mineria) was established for the purpose of supporting small and medium scale mining in 1960 (JICA, 2002). ENAMI devotes itself to promote the development of small and medium scale mining. Without operating its own mines, ENAMI provides small or medium-scale miners with partially subsidized services at purchase of ores to boost productivity, especially when copper price is unfavorable to the industry. ENAMI achieves its role by processing these crude or intermediate materials through its plants and smelters to widely marketable products, like electrolytic copper, gold, silver and so on. ENAMI provide processing service well as marketing service on behalf of small or medium miners to promote the sector.

Adopting similar applicable activities of ENAMI to the case of Albania chromite mining, the suggested roles of association of chromite mining are summarized below.

a. Support mine development by financing
Development of mines is usually accompanied with financial risks because the market price of chromite often fluctuates. The association would provide the mining companies with long or short term loans, guarantee against risks and other benefits to promote the development.

b. Purchasing ore and processing in concentration plant
The association would purchase chromite ore from small companies and low grade chromite ore would be sent to concentration plant before sending it to smelting plant. The price of purchasing chromite ore is set between high price and low price of chromite ore market. If the price becomes higher than the association price, the balance will be saved in the association for preparing for the time of low price.

c. Work actively for operation improvement, new technology and countermeasure for environmental problems.
In addition to above, in the case of chromite mining in Albania, it is necessary for the association to have functions of sharing equipments for mining operation and concentration plant. Mine rescue team of regional level should be organized in the association to be sent to even small mine in remote areas.
It is necessary to establish either association of chromite mining by financial assistance of the government or state company with above mentioned function.

The movement similar to founding association is already observed in Batra mine where five people, 3 mine owners of small companies, one investor (Albanian) and one Chinese investor, invested for establishing small concentration plant and it is operational now, treating 3,000 tons/month of chromite ore. But not only Batra area but if whole area of Albania is considered, it is necessary to establish the association of chromite mining assisted by the government.

In Albania chromite mining is conducted in three separate areas of Tropoja-Kukes, Bulqiza、Shebeniku-Pogradec and, in these three areas, it is necessary for both of big companies and small companies to continue mining operation. If small companies maintain recent production amount in future by foundation of association and Albanian Chrome attain the target production of 250,000 tons/year, and if Kalimash-Vlahna mine produce chromite ore of 210,000 tons/year according to the contract, chromite production will become more than twice (675,000 tons/year) of present production (Table 4.2.14) .

It is difficult for small companies to constantly continue mining operation. But if the association of small companies is established, they can continue mining operation avoiding closing mine. In this way chromite resources of Albania are efficiently utilized and stability of local society is maintained.

Table 4.2.14 Target production of chromite ore

Tropoja-Kukes	2009 (t)	Future (t/year)		
	Production of ore	Production of ore	Concentrates	Ferrochrome
Association of small companies	49,899	50,000	-	-
Kalimash Mine	0	210,000	90,000	30,000
Sub Total	49,899	260,000	90,000	30,000

Bulqiza	2009 (t)	Future (t/year)		
	Production of ore	Production of ore	Concentrates	Ferrochrome
Association of Small companies	154,924	150,000	-	-
Albanian Chrome	78,437	250,000	-	24,000
Sub Total	233,361	400,000		24,000

Sheb-Prog	2009 (t)	Future (t/year)		
	Production of ore	Production of ore	Concentrates	Ferrochrome
Association of small company	15,163	15,000	-	-
Sub Total	15,163	15,000		

Grand Total	298,423	675,000		54,000

2) Establishing integrated system of chromite production

For bringing benefit to Albania by optimal use of chromite resources, it is necessary to establish an integrated system of chromite mining, including processes of mining-dressing-smelting. Chromite ore production of Albania in 2009 is 298,000 tons, but production of ferrochrome is as low as 6,000 tons.

At preset, operational smelting plant of chromite in Albania is only Elbasan Smelting Plan operated by Albanian Chrome and only chromite ore exploited by Albanian Chrome in Bulqiza mine is used for smelting. Concentration plant is only found in Bulqiza-Batra area and, in the northern part of Tropoja –Kukes area, low grade chromite ore is sent to a concentration plant of Kosovo. For establishing the integrated system of production (mining-dressing-smelting) in Albania, additional concentration plants and smelting plants are necessary.

The material flow for establishing integrated production system is shown in Figure 4.2.24. Although, in the concession contract between the government and Albanian Chrome, operation of Elbasan smelting plant, operations of Burrel smelting plant and Klos concentration plant after rehabilitation of them are included in addition to operation of Bulqiza mine, so far nothing has been done at Burrel and Klos. In the contract of Kalimash and Vlahna mines between the government and JV of Turkish and Chinese companies, building two concentration plants, Kalimash and Goraj, and establishing one smelting plant are included in addition to operation of two mines. The target ferrochrome production of smelting plant of Kalimash-Vlahna mines is 30,000 tons/year and Elbasan smelting plant is setting target of ferrochrome production of 24,000 tons/year. But both of the smelting plants are only considering using chromite ore of their own to attain the targets of ferrochrome production. For small companies, there is actually no smelting plant to where they can send chromite ore or concentrates. It is necessary for the government to establish structure in which small company can send ore and concentrate to smelting plant. In future, three smelting plants of Kalimash, Burrel and Elbasan will be operational. If these three smelting plants accept chromite ore of small companies in addition to their own, the capacity of annual production of ferrochrome at each smelting plant should be around 50,000 tons/year. Among the small companies, there are some plans of establishing small smelting plant by corporation of few companies, but there is no confirmation of this small smelting plant being feasible.

AKBN or AKBN with some experts should conduct a study to find an optimal system for smelting the chromite ores and concentrates of big companies and small companies.

By the contract of the Kalimash-Vlahna mine, two concentration plants will be established in Tropoja –Kalimash area, where there is no concentration plant now. Particularly in this area, since chromite ore is generally relatively low (around 20Cr2O3 %,), most of the chromite ore must be sent to concentration plant before smelting process.

By completing the material flow described above, it is necessary for Albania to establish chromite mining industry in line with world market and, then, ferrochrome can be exported to European and China.

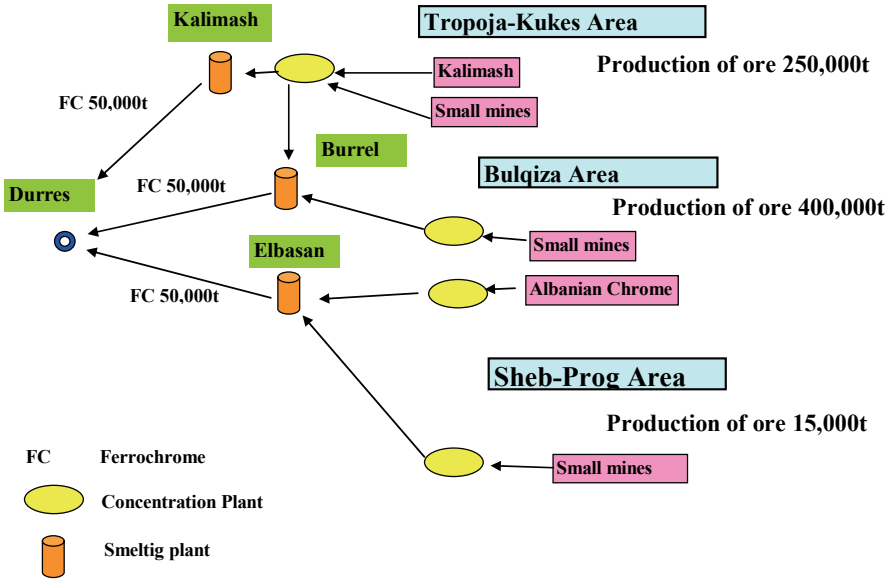


Figure 4.2.24 Material flow of future

3) Assuring mineral resources

According to AGS information, mineral resource of chromite ore is 32.8 million tons (B+C1+C2) and, further, a total of chromite resource declared by each of concession holder in 2009 is 7.79 million tons. But these values are mineral resources, not mineral reserves. For the sustainable exploitation of chromite deposits, it is, consequently, necessary to grade up these values to mineral reserves by adding factors of economy viability and feasibility by conducting surveys. It is, also, necessary to find new chromite deposits.

(1) Up grading resources to reserves

Most of the amounts of resources claimed by exploitation license holders are B+C1+C2 of Albanian classification, corresponding to indicated or inferred resources of the international classification. For assuring chromite resources for making exploitation plan of future, it is necessary to upgrade these values of mineral resources to mineral reserves. If the results of the survey suggest insufficient remaining reserves for particular mine under operation, closing of mine should be considered after taking out remaining ore. For the survey of upgrading resources, it is necessary to conduct drilling and feasibility studies. Although it is big economic burden for mine owner of small companies, it is necessary for making future exploitation plan. As mentioned in the previous section of (2) in 1), financing for this should be assisted by the association of small companies.

(2) Exploration work for finding new deposits

Since chromite deposits do not have geochemical and geophysical halos in their surrounding zone, it is difficult to find concealed deposits. The exploration of chromite deposit, therefore, starts from field survey trying to find fragments of chromite ore along rivers running through the area of ultramafic rocks. If the fragments of chromite ore are found, tracing of fragments continues toward upper stream to find exposure of the chromite mineralization. In Albania, vigorous exploration work was conducted for chromite deposits, particularly in 1970s by the state exploration agency and 1,100 occurrences of chromite mineralization are known. It is, therefore, difficult to find new locations of exposed chromite mineralization anymore. The exploration work should be conducted by tracing known mineralization by detail geological survey and drilling survey based on the information of existing mineral occurrences and deposits. Because of occurrences of many folds and faults in ultramafic rocks, detailed geological surveys are necessary. As shown by Beqirai et al., (2000), the horizon of the occurrences of chromite deposit are mostly restricted in transitional zone of crust-mantle and upper to middle horizon of harzburgite tectonite. It is necessary to conduct detailed geological surveys by establishing lithological classification and stratigraphic sequence.

Two areas are recommended as prospective area for future exploration program,

-Zogaj mine and its surroundings in Tropoja-Kukes massif with mineral resources of 1.24 million tons.
-Area of transitional zone to tectonite harzburgite between Krast mine and Ternova mine.

Currently, two Canadian junior companies are conducting exploration work of chromite, respectively, in Tropoja-Kukes massif and Bulqiza massif. Other than these, 64 exploration licenses and 4 prospecting licenses are registered by Albanian company. It is necessary for AGS to establish detailed lithological classification and structure of ultarmafic massifs through reviewing existing information and field survey based on the modern theory of ophiolite. Exploration companies can purchase the results of these as guide for exploration program and a part of results should be accessible by internet for foreign investors.

4.3 Copper

4.3.1 Overview of the Copper Mining

Mineable copper deposit type in Albania is the volcanogenic massive sulfide deposits (VMS) which occur mainly in the northern six regions of Albania (Figure 4.3.1).

During the planned economic regime, plenty of deposits were discovered through systematic exploration by Albanian Geological Survey (AGS). ALBAKER, government mining corporation, developed some of them for mining operation and produced cathodes in Albania. The largest mine was the Gjegjan mine which produced 145kt of copper metal. However most of the deposits were small deposits containing less than 50kt of copper metal. Owing to lack of international competitiveness, these mines were forced to stop operation after transformation to a free market system and then in 1997 the copper mining industry was completely ceased. In 2001, BERALB, Turkish mining company participated copper mining and they started production in the Munelle mine. Currently BERALB is operating both the Munelle and Lak Roshi mines and exporting copper concentrates to China.

Since 2007, TIREX, Canadian junior mining company and other 3 foreign exploration companies have been conducting exploration with world standard tactics and discoveries of new mineable deposits are expected. According to data of AKBN, remaining copper resources are estimated to be 21.67 million tons with 1.86% Cu. Except for the Munelle and Lak Roshi deposits, others are too small to consider starting mining operation at present. Judging from geology in Albania, it is assumed that the probability of discovery of the world class copper deposits is very low, but discovering few minable deposits with few hundred kt copper metal seems to be possible. In order to encourage copper mining in Albania, it is urged to discover mineable deposits as soon as possible. However exploration and mining by domestic mining companies are thought to be difficult in view of technology and finance, so it is necessary for the government to take some actions to attract foreign investors.

4.3.2 Past Production

The modern copper mining in Albania started before World War II by the Italian enterprise in the Rubik area. After the war, the Albanian government took actions for promotion of copper mining. As a result, a lot of new copper deposits were discovered as shown in Figure 4.3.1 and Table 4.3.1. The Albania government developed 25 mines and established 7 beneficiation plants, 3 smelters and 2 refinery plants, and one fabrication factory (Figure 4.3.2). The operated mines were mainly concentrated in Has, Tropoja, Puka, Mirdita, Kukes and Lezhe provinces, northern part of Albania excepting the Rehove mine located near the border with Greece.

Except for the Gjegjan deposit, most of the deposits were developed by the method of sub-level caving, however interval of each sub-level was not exceeded 6-7m due to the capacity of rock drill. Recovery rate of ore was 70-80%, productivity of per annum was 600-650t/person and production cost was 12US$/t.

As shown in Table 4.3.2, each beneficiation plant received crude ores from one to nine mines located near the plant. The technology and facilities were so old that recorded mineral recovery rate was 75-85%, grade of copper concentrate 16.4%, annual production capacity of each plants 55-60kt/a at maximum and beneficiation cost of 6US$/t of ore. Capacity of each plant is shown in Table 4.3.2.

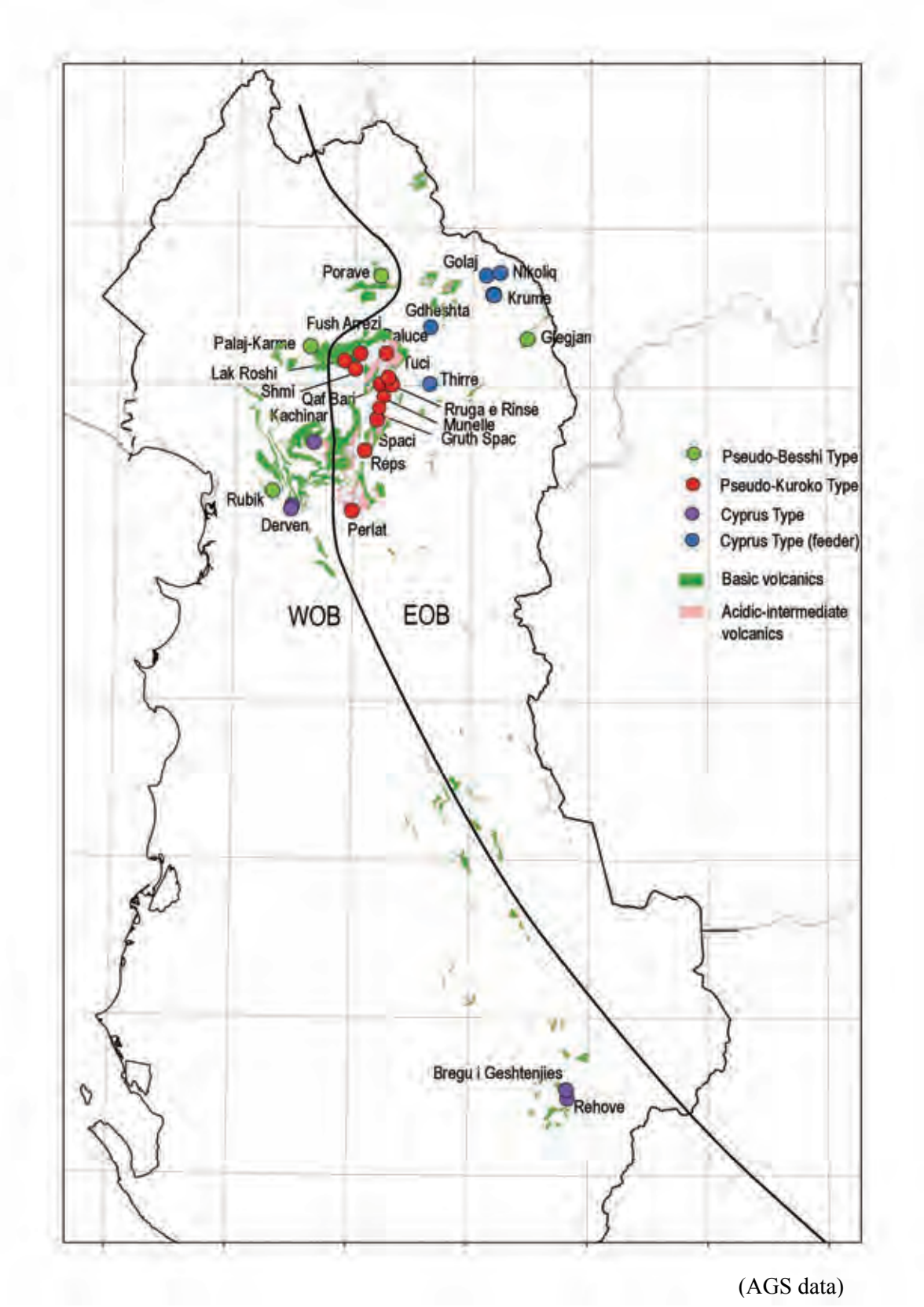


Figure 4.3.1 Distribution of major copper deposits

Table 4.3.1 List of major copper deposits

Name	Belt	Deposit Types by Albania	Deposits Type by BCGS	Country Rock	Stratigraphy	Morphology of Ore Body	Ore Mineral	Alteration	Original Geological Reserves (Mt)	Cu(%)	Zn(%)	Au(g/t)	Remaining Geological Reserve (t)	Cu(%)	Zn(%)	Au (g/t)	Status	Production Period	Total Production	Cu Grade (%)	Current Mining Concession
Fushe Arrezi	EOB	hydrothermal	pseud-Kuroko	basaltic andesite pillow lava, sheeted dyke	basaltic andesite pillow lava ← sheeted dyke	stockwork L200×D250-300	cp、py、	chl	0.82	1.71			151,000	1.71			not yet operated				-
Gdheshta	EOB	hydrothermal	Cyprus-feeder	gabbro									197,000	1.00			closed	1978-1990			
Gjegjan	EOB	volcano-sedimentary	pseud-Besshi	basalt, meta-sedimentary rocks	melange(basalt, chert, greenschist, amphibolite	lenticular L300×400×T20	cp, py,sp, ma, hm, mg, co, cc,		5.28	3	0.5		61,000	2.56			closed	1961-1995	4,419,373	3.29	-
Golaj	EOB	metasomatic	Cyprus-feeder	gabbro					1.1	1.0			429,630	0.602			closed	1986-1993	96,916	0.52	-
Gurth Spaci	EOB	volcano-sedimentary	pseud-Kuroko	basalt/andesite	-limestone -andesite/dacite aggl -basaltic andesite pillow lava←plagiogranite, dacite dome	lenticular several ore bodies along 4-5km Lfew-300×W150×T15	py, cp, sp, ten-tet,bo, co, cc, ga, el	sil, chl, ser, kao, zeo	2.7	1.25	2.62	0.55	58,000	2.85			closed				-
Gurth 1	EOB		pseud-Kuroko										58,000	2.85			closed		55,462	2.28	-
Gurth 2	EOB	volcano-sedimentary	pseud-Kuroko										227,000	1.14	2.1-2.3		closed	1984-1989			-
Gurth 3	EOB		pseud-Kuroko										200,355	2.38	3.3		closed	1989-1992			-
Kcire	EOB												126,339	1.45			closed	1986-?			-
Krume	EOB	hydrothermal	Cyprus-feeder	gabbro									56,000	4.4			closed		31,974	1.674	-
Kullaxhi	EOB								0.37	1.06			372,592	1.06			closed	1983-1990			-
Kurbnesh	EOB	metasomatic	Cyprus-feeder	gabbro	gabbro	vein, veinlet	po, cp, py, ma, cob, arpy, cu, mt,	chl	3	1		1.0					closed				-
Lak Roshi	EOB		pseud-Kuroko	basaltic andesite pillow lava, dacite/ryolite dome	basaltic andesite pillow lava/andesite/dacite volcanoclastics ←sheeted dyke, dacite/ryolite dome, diorite/plagiogranite	-massive L300-400×D500×T1-40 -stockwork 2,000×500	cp, py, sp, mt, ga, bo, ten-tet, el	chl, epi, zeo, arg, sil, cal	2.7	1.94	0.05	0.3	485,361	5.09		1.51	operating		317,246	3.94	BERALB (Turkey)
Lamskon	EOB	hydrothermal-volcanogenic	pseud-Kuroko	basalt/andesite													closed				-
Maja e Madhe	EOB	hydrothermal-volcanogenic	pseud-Kuroko	basalt/basaltic andesite					0.15	1.54							closed				-
Munella 1	EOB	volcano-sedimentary	pseud-Kuroko	andesite/dacite aggl, dacite dome	-limestone -melange -andesite/dacite aggl ←dacite dome, plagiogranite	4 ore bodies L150-300×T10-70×D100-250	py, cp, sp, ten-tet, gal, ba, el	sil, chl, zeo, epi									closed				
Munella 2	EOB	volcano-sedimentary	pseud-Kuroko	rhyo-dacite					8.6*	0.97	0.68	0.7	7,968,940	1.3			operating				BERALB (Turkey)
Nikoliq 1	EOB	hydrothermal	Cyprus-feeder	gabbro		lode T0.5-10×L200-300			2.96**	2.14	-	-	202,000	1.5			closed	1986-1999	170,000	1.2	-
Nikoliq 2	EOB	hydrothermal	Cyprus-feeder	gabbro									560,000	2.3			closed				-
Paluce	EOB	hydrothermal metasomatic	pseud-Kuroko	basaltic andesite pillow lava	basaltic andesite pillow lava ←sheeted dyke, dacite/ryolite dome, diorite/plagiogranite	stockwork L150-200×T10-20	cp, py, sp	chl, sil, epi, ser, zeo	1.5	1.2	-	-	2,356,000	1.49			closed	1983-?			-
Perlat Jugor	EOB		pseud-Kuroko	basalt andesite volcanics	lenticular L100×T20				3.5	2.6	0.2	0.4	1,402,930	2.88		1.5	closed	1980-1997	754,745	2.44	-
Qaf Bari	EOB	hydrothermal-metasomatic	pseud-Kuroko	contact between pillow lava and dacite dome	-dacite dome -basat andesite pillow lava -plagiogranite	lenticular (massive, brecciated, vein) L400-700×D500-600×T40	py, cp, sp, ten-tet, bo, ma, el	chl, sil, epi, ser, zeo, cal	3.1	2.14	0.15	0.5	330,000	1.45			closed	1975-1998			-
Reps	EOB	hydrothermal-volcanogenic	pseud-Kuroko	basalt/basaltic andesite					1	1							closed				-
Rruga e Rinise	EOB	volcano-sedimentary	pseud-Kuroko	basalt/dacite					0.52	1.1			387,805	1.0			closed	1983-1991			-
Shemaria	EOB	hydrothermal	pseud-Kuroko	gabbro		vein							403,500	0.85			closed	-1983			-
Shmi	EOB	hydrothermal	pseud-Kuroko	basalt					1	1.36							closed				-
Spaci	EOB	hydrothermal metasomatic	pseud-Kuroko	basaltic andesite pillow lava	-andesite/dacite agglo. -basaltic andesite pillow lava -quartz diolite/plagiogranite				10	1.1	-	-	3,274,000	0.984			closed	1966-1999	3,274,000	0.984	Tete Mining (Turkey)
Thirre	EOB	metasomatic	Cyprus-feeder	plagiogranite		vein, veinlet T0.5-10			1.2	1.3	-	-	333,752	1.7			closed	1973-1976 1980-1994			-
Tuci	EOB	hydrothermal metasomatic	pseud-Kuroko	basaltic andesite pillow lava	basaltic andesite pillow lava, sheeted dyke, plagiogranite	stockwork L350×W400		chl, epi, sil, ser, zeo	1	2	-	-	500,000	1.5			closed	1977-1999	1,283,195	1.0667	-
Bregu i Geshtenjes	WOB	hydrothermal	Cyprus	basalt									1,733,243	2.09			closed				-
Derven	WOB	hydrothermal metasomatic	Cyprus	pillow basalt (MORB)	-pillow basalt -gabbro(tectonic) -ultrabasic rock(tectonic)	diss. 700×100×300	py, cp, ma, sp, mt, il, bo, cc, co		1.6	0.98	0.24	-	1,248,558	0.98			closed	1972-1994	818,000	0.54	-
Kachinar	WOB	Hydrothermal volcanigenetic	Cyprus	pillow basalt (MORB)	-pillow basalt -gabbro (diorite)	lenticular 100×14	py, cp, sp, co, bo, cc	chl, kao, qtz, cal, py, zeo	0.3	3.85	1.55	0.5	126,339	1.45			closed	1968-1991	507,000	1.75	-
Palaj-Karme	WOB	volcano-sedimentary	Cyprus	pillow basalt (MORB)	-pillow basalt -volcanosedimentary series -Creta/Eoc flysh	pipe 1500×20-50	py, cp, sp		2	2.48	0.9	0.4	56,000	4.42			closed				-
Karme 1	WOB	volcano-sedimentary	Cyprus	effusive/sedimentary rocks									152,000	2.22			closed	1997-?			-
Karme 2	WOB	volcano-sedimentary	Cyprus	effusive/sedimentary rocks									963572	2.5			closed	1989-1996			-
Porave	WOB	volcano-sedimentary	pseud-Besshi	shale, volcanics			py, cp, sp, hm		0.3	2.15	1.4	-	180,000	?			closed	1974-1991	40,000		-
Rehove	WOB	volcano-sedimentary	Cyprus	pillow basalt (MORB)	-melange -pillow basalt -basaltic agglomerate	sheet-lenticular -pipe (φ40×80)	py, cp, sp, mt	chl, ep. Arg	5	1.86	0.5	0.6	240,000	1.83			closed	1978-1990 1980-1999	216,000	1.464	Dedeman (Turky)
Rubik	WOB	volcano-sedimentary	pseud-Besshi	basaltic pillow lava	-limestone -basaltic pillow lava -gabbro -ultabasic rocks	sheet-lenticular 500×300×19			1.5	2.01	0.7	0.5	968,570	2.0			closed	-1960 1990-1996	200,000+42,686	2.27+1.304	-

Data: AGS database and Hoxa et al., (2005)

(data from AGS and Hoxha et al., 2005)

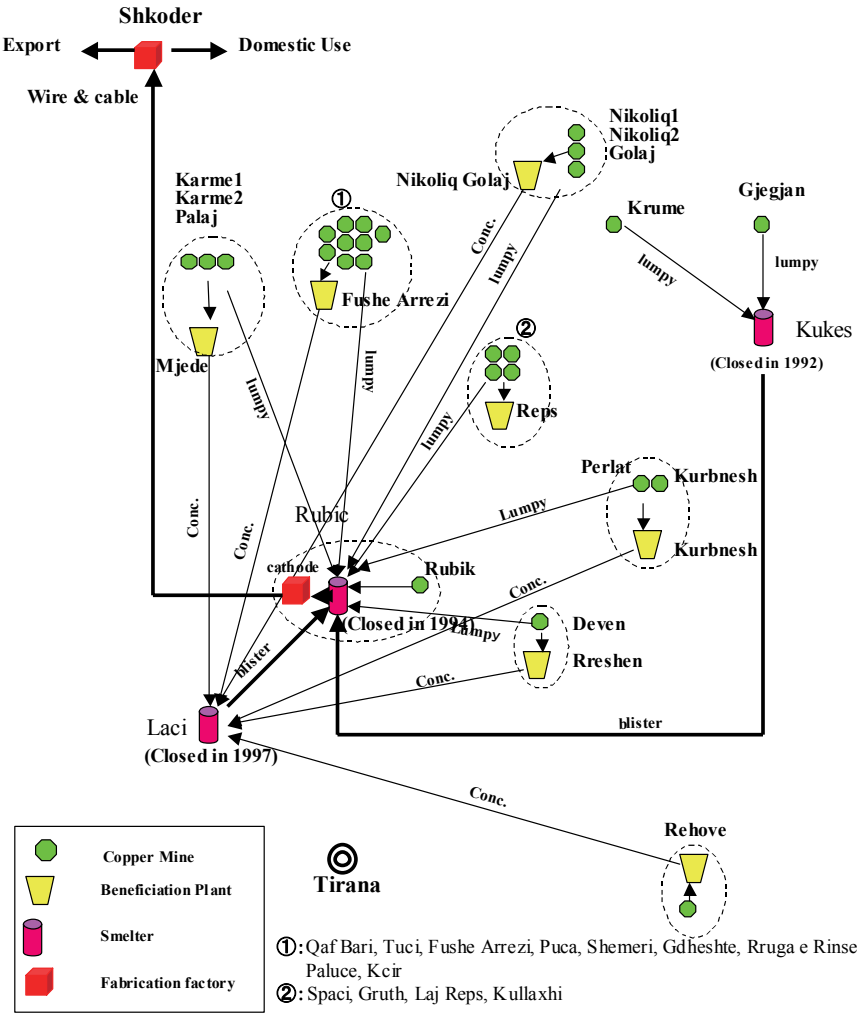


Figure 4.3.2 Copper material flow before 2000

High grade lumpy ores were sent directly to the smelters without milling. Low grade ores under 2% Cu were treated at the beneficiation plants. The Kukes smelter treated only lumpy ore and then blisters were sent to the Laci refinery. Concentrates were sent to smelters such as the Rubik or Laci smelter, and blisters were refined there. Some of the blisters produced at the Rubik smelter were refined at the Laci refinery. At the Rubik plant, other metals such as gold, silver and selenium were recovered from residual dross. The Laci smelter also produced sulfuric acid as a by-product which was then used for producing fertilizer at the chemical plant in Laci. Cathodes (electric copper) were manufactured to wire and bar at the Shkoder factory and then shipped to foreign countries and local users. Total productions of by-products recorded are as follows; H_2SO_4: 20,000t, Au: 100kg, Ag: 1000kg, Se: 4t, bronze and brass: 1,200t, and copper sulfate: 1,500t respectively. Capacity of each smelter and refinery was shown in Table 4.3.3.

Production of copper and other by-products have increased since 1960s and culminated in the late 1980s. In 1987, 1,166,000 tons of crude ore, 55,000 tons of concentrates and 16,000 tons of refined copper were produced as shown in Figure 4.3.3. Given that grade of crude ore was 2.0%Cu and recovery rate was 70%, estimated production of refined copper was around 16,000 tons. This figure is the same number as Japanese copper production in 1988. However refined production was too small as one country. Under the planned economic regime production was controlled by the ALBKER, however they focused on achieving targets and not on profitability. At the end of the planned economic regime in 1991, the production of copper drastically dropped and a struggle with the privatization of mining industry continued. Due to the economical difficulties and breakout of a riot, the smelters were forced to stop production and the copper mining industry in Albania collapsed

completely until the re-start of operation in 2007 by foreign investors. After stopping operation, mines, beneficiation plants and smelters/refineries were laid in ruin and in some area mining pollutions were remained.

Table 4.3.2 Copper beneficiation plants

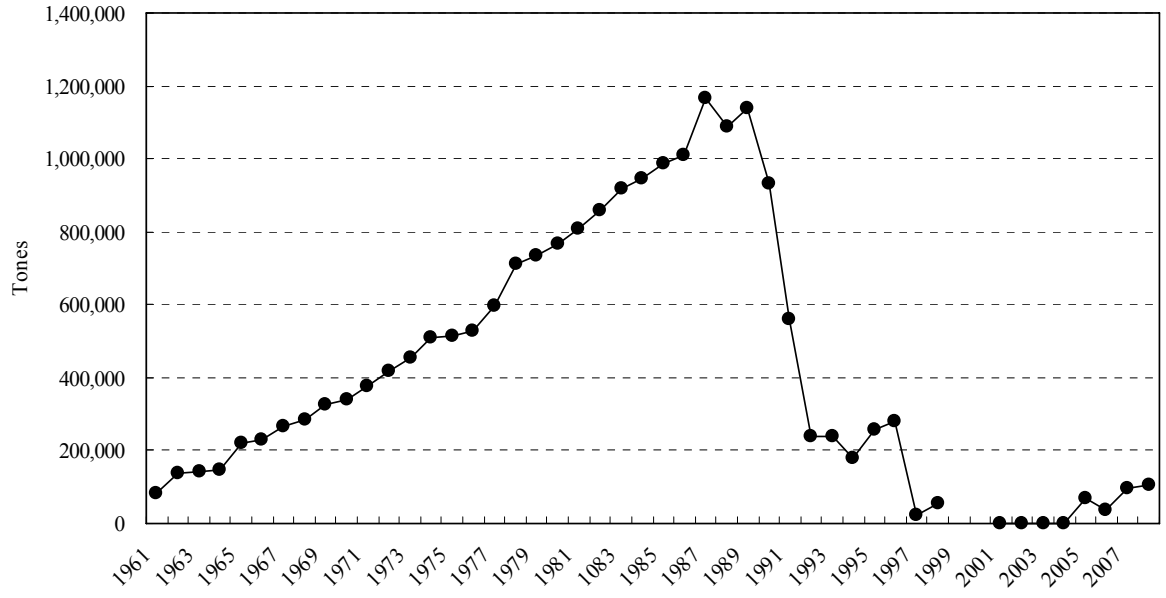
Plant	Capacity (t/a)	Current situation
Mjede	60,000	closed in 1993
Nikolq Golaj	60,000	closed in 1996
Reps	240,000	closed in 1997
Rehove	60,000	closed in 1990
Rreshen	60,000	closed in 1993
Kurbnesh	120,000	closed in 1990
Fushe Arrezi	240000 200,000	closed in 1997 re-opened in 2007

(data from AKBN)

Table 4.3.3 Copper smelter

Smelter	Capacity (t/a)	Current situation
Rubik	4,000	closed in 1988
Kukes	6,000	closed in 1991
Laci	6,500	closed in 1997

(data from AKBN)



(averaged value from AKBN)

Figure 4.3.3 Copper ore production in Albania

4.3.3 Current Copper Mining Activity

Under the revised mining law (1994), mining licenses could be granted to private mining companies. In 1996, NEBEREX, Canadian junior mining company first acquired exploration license in the Puka-Mirdita region, however they dropped out due to financial problem. Afterwards, BERALBA, a local subsidiary of the Turkish mining company obtained mining license in 2001 and started operation of the Munelle mine in 2007.

As shown in Table 4.3.4, the exploitation licenses registered as of January 2010 are only 5 (2 for BELALB, 1 each for Tete Albania Tunneling & Mining, Glejdis and Echo). However license of Glejdis is for slag of Laci smelter and that of Echo is for tailings of the Gjegjan mine. The number of the exploration license is 16. Total coverage of all licenses is 661.919km^2. Among the licenses, Albanian company is only 5 including Kromex. Others are foreign companies, gathering in northern part of Albania, especially in the Puke-Mirdita region. It goes without saying that current copper mining is not so active.

Table 4.3.4 Registered licenses of copper

2010.01.01

Mine	Company	Region	License	Category	Coverage (km2)	County
Lak Loshi	BERALBA shpk	Puke	27.08.2001	Exploitation	0.09	Turkey
Munelle	BERALBA shpk	Puke	27.08.2001	Exploitation	0.68	Turkey
Laci smelte	GLEJDIS shpk	Kurbin	08.08.2006	Exploitation	0.0073	Albania
Gjegjan	Echo shpk	Kukes	11.05.2007	Exploitation	0.26	Albania
Spaci	Tete Albania Tunnel&Mining shp	Mirdite	20.08.2007	Exploitation	0.39	Turkey
	Jab Resources Ltd	Mirdite	04.01.2008	Exploration	22.4	Australia
	Jab Resources Ltd	Mirdite, Lezhe	04.01.2008	Exploration	10.4	Australia
	Ballkan Resources Ltd	Mirdite	09.01.2008	Exploration	0.025	Canada
	Ballkan Resources Ltd	Mirdite	09.01.2008	Exploration	0.1	Canada
	Ballkan Resources Ltd	Mirdite	09.01.2008	Exploration	0.088	Canada
	Ballkan Resources Ltd	Mirdite	09.01.2008	Exploration	0.1	Canada
	Dedeman Albania Mining Ltd	Korce	17.03.2009	Exploration	24.5	Turkey
	Tirex Explorations Ltd	Puke, Midita	04.06.2009	Exploration	145.65	Canada
	AU-Pet shpk	Has	23.06.2009	Exploration	26	Albania
	Kromex shpk	Kukes Mirdita	29.07.2009	Exploration	231.42	Albania
	Markaj shpk	kukes	28.08.2009	Exploration	1.236	Albania
	Cougar Mining Ltd	Kukes	01,12,2009	Exploration	200	Canada
Total					661.919	

(From METE)

1) Exploration

After withdrawal of NEBEREX, in 2007 the Tirex Exploration, Canadian junior mining company, acquired exploration licenses in the Puka- Mirdita region covering 550km^2 and started exploration activity based on the conceptual exploration model of the Noranda type volcanogenic massive sulfide deposits. The company applied the common exploration methods for volcanogenic massive sulfide deposits such as airborne magnetics, airborne EM and IP for volcanogenic massive sulfide deposits. The methods such as airborne geophysics were the first time to have been conducted in Albania. The TIREX has conducted 47 drill holes, 15,400m so far to follow up geophysical anomalies and obtained some promising results i.e. in MR08-2 intersected 60.4m, 1.1% Cu, 6.7% Zn and 1.6g/t Au, and etc. (http://www.tirexresources.com/).

Balkan Resources, Canadian junior mining company, is also conducting drilling at closed Perlat mine located at the southern margin of the Puka-Mirdita region, targeting volcanogenic massive sulfide deposits (http://www.balkanresources.com/). They, also, hold license of tailings, interested in recovering copper from accumulated tailings which is thought to contain higher grade of copper.

Jab Resources, Australian junior mining company, started exploration covering area of 100km^2 near Rubik in 2009, targeting at the gold bearing volcanogenic massive sulfide deposit, and they have already discovered gold anomalies in gossan (http://www.jabresources.com/). The highest grade of gold recorded is 320g/t in quartz vein. However the mining license has been terminated at present.

Volcanic Metals, also Canadian junior mining company, recently acquired exploration license around the Gjegjan deposit, covering area of 200km^2 in the Eastern Ophiolite Belt and they have already finished airborne geophysics (GEOTECK VTEM, heliborne magnetic and electro magnetics) with expenditure of Can$300,000 (http://www.volcanicmetals.com/).

These junior mining companies have been conducting their activities in Albania by hiring Albanian geologists and mining engineers who were ex-staff of university or AGS, being acquainted with governmental organization and accustomed to the Albanian regulation framework.

2) Mining

In 2001, BERALBA shpk, a subsidiary of Turkish company Nesco Metals (former Ber- Oner) were granted a mining license in ex-Munelle mine and began development of the mine, and they started production in 2007. In 2009, the company also re-started operation of the Lak Roshi mine located near the Munelle mine. These two are currently operating copper mine in Albania.

The geological reserve[*1] of the Munelle mine is estimated to be around 8 million tons at 1.3% Cu. Among it, industrial reserves[*2] is 5 million tons at 1.03%Cu. On the other hand, the Lac Roshi mine contains 2.7million tons of geological reserve at 1.94%Cu, and 0.48 million tons of mineable reserves at 3.84%Cu. The excavations of both mines are conducted by sub-level caving and trackless mining method using 6 LHD.

In the Munelle mine, they excavate high grade part of the deposits, called Munelle II located below 850m level. In 2009, they produced 70,000t at 3.3%Cu of crude ore in the Munelle and 30,000t at 3.3%Cu in the Lac Roshi respectively. The company has a plan to increase ore production to 250,000 t/a and then finally to 500,000t/a, combining the production of both mines.

Crude ores from both mines at grade of 3%Cu, 2%Zn, 3g/tAu and 60g/tAg are processed at the Fushe Arrezi beneficiation plant located 11 km north of the Munelle mine, which BERALBA rehabilitated ex-Fushe Arrezi plant operated by ALBKER during the planned economic regime. The recovery rate is 85%, raised from 77% by innovation. Unfortunately zinc is not recovered and tailings with zinc are accumulated in tailing dam. Copper concentrates are shipped to China via Shenggjin port. Pure excavation cost is estimated to be 18US$/t and cost including depreciation and tax is 32US$/t. The BERALBA is now considering to re-open the Karma mine located in Shkoder province.

Tete Mining, Turkish mining company, tried to re-open the Spaci mine, however it seemed to be suspended at the moment due to shortage of funds.

In many places, tailings from beneficiation plants are found near plants being operated during the planned economy regime. Judging from technology at that time, recovery of copper is thought to be insufficient. Since deposits in Puka-Mirdita region are characterized by the poly-metallic pseudo-Kuroko type with deposits, possibility of remaining of zinc, gold, silver with other valuables elements in the tailings is thought to be high. AKBN has strong concern about recovery of metals from tailings. Moreover Balkan Resources Co. Ltd owns mining concession of the tailings dam such as Kurbnesh, Lak Roshi and Perlat mines, considering recovering copper from the tailings.

[*1] Equivalent to inferred mineral resource of JORC code
[*2] Equivalent to indicated mineral resource of JORC code

4.3.4 Potentiality of Copper Resources

1) Geology and copper deposit

Albania is occupied by Jurassic ophiolites which were generated by closure of the ocean of the Neo-Tethys. Ophiolite of the northern Albania is called as Miridita ophiolite, covering around 3,000km^2 and it consists of two separate zones with different tectonic origin. They are Western Ophiolite Belt (WOB) in the west and Eastern Ophiolite Belt in the east. The former one is characterized by the mid-oceanic ridge basalt, rude sheeted dyke complex and lherzolite/harzburgite. On the contrary, the latter is characterized by acdic to intermediate volcanics of island arc thoreiite, boninite, dense sheeted dyke complex, cumulates and harzburgite tectonite ((Bortolotti et al., 2005). The copper deposits of Albania are volcanogenic massive sulfide deposits genetically associated with volcanic and plutonic sequences of the ophiolite complex (Hoxha et al., 2005).

In Albania the volcanogenic massive sulfide deposits have been classified into volcanogenic deposits, volcano-sedimentary deposits and quartz-sulfide deposits by the field occurrence. The volcanogenic deposit occurs in association with volcanics, the volcano-sedimentary deposit occurs in mélange and the sulfide-quartz type is hosted in the plutonic member of ophiolites. In this report, using deposit type by tectonic environment, they are respectively called as; Cyprus type, pseudo-Besshi type and pseudo-Kuroko type. Sulfide-quartz type hosted in the plutonic member is named as Cyprus (feeder).

The deposits in the WOB are associated with MORB and they are characterized by the Cyprus type, to which modern analogue is TAG in mid-Atlantic ridge, and pseudo-Besshi type deposits which is massive deposits in mélange. The representative deposit of the former one is the Rehove and the latter is Rubic deposits. In the EOB, pseudo-Kuroko type deposits (i.e., Munelle deposit), associated with dacite, rhyolite and the Island Arc thoreiite, and Cyprus type deposits (i.e., Perlat), associated with basalt, occur. The pseudo-Kuroko deposits are concentrated in the Puka-Mirdita region. The Cyprus type (feeder) occurs in plagiogranite, gabbro and pyroxenite as vein or veinlets and examples of them are Nikoliq, Golja and Kurume. However they seem to be not important because of small size. The “pseudo Besshi” type deposit, tentatively named, is recognized only at one location of Gjegjan. It shows peculiar occurrence of elongated thin plate like form with 300m×400m extension and width of 20m. A hanging wall is basalt and a footwall is occupied by chaotic slate and chert. Excavated volume is estimated to be 4.4 million tons with 3.29% Cu, which contains 145kt of copper. In Albania it is classified as volcano-sedimentary deposits and thought to be mélange type deposit. If the deposits occur in mélange, it will be difficult to find large ore bodies, similar to Gjegjan size. Recently Volcanic Metals, Canadian junior mining company, has announced that they started airborne exploration, trying to find this type of deposits near Gjegjan.

2) Potentiality of copper resources

Generally VMS deposits are smaller but higher grade compared with porphyry copper deposits and IOCG (Iron Oxide Copper Gold) deposits as shown in Figure 4.3.1. According to the grade-tonnage model proposed by Cox and Singer (1992), copper content of the Cyprus and Kuroko type deposits are both smaller than that of world class deposits of porphyry copper and IOCG types. Resources of top 10 to 50% of 49 Cyprus type deposits range from 1.6 to 17 million tons. Copper grade of the Cyprus type deposit ranges from 1.79% to 3.8% with average Au grade of 1.5g/t. While the Kuroko type deposits, resources of top 10 to 50% of 432 deposits range from 1.5 million tons to 18 million tons. Copper grade of the Kuroko deposit ranges from 1.3 to 3.5%, zinc grade from 2 to 8.7% with average gold grade of 2.3g/t. Galley et al. (2007) also estimated the average size and grade of the Cyprus type deposit as 1.3 million tons with 3.2%Cu and 1.9%Zn and the Kuroko deposits as 5.5 million tons with 1.3%Cu and 6.1%Zn, respectively.

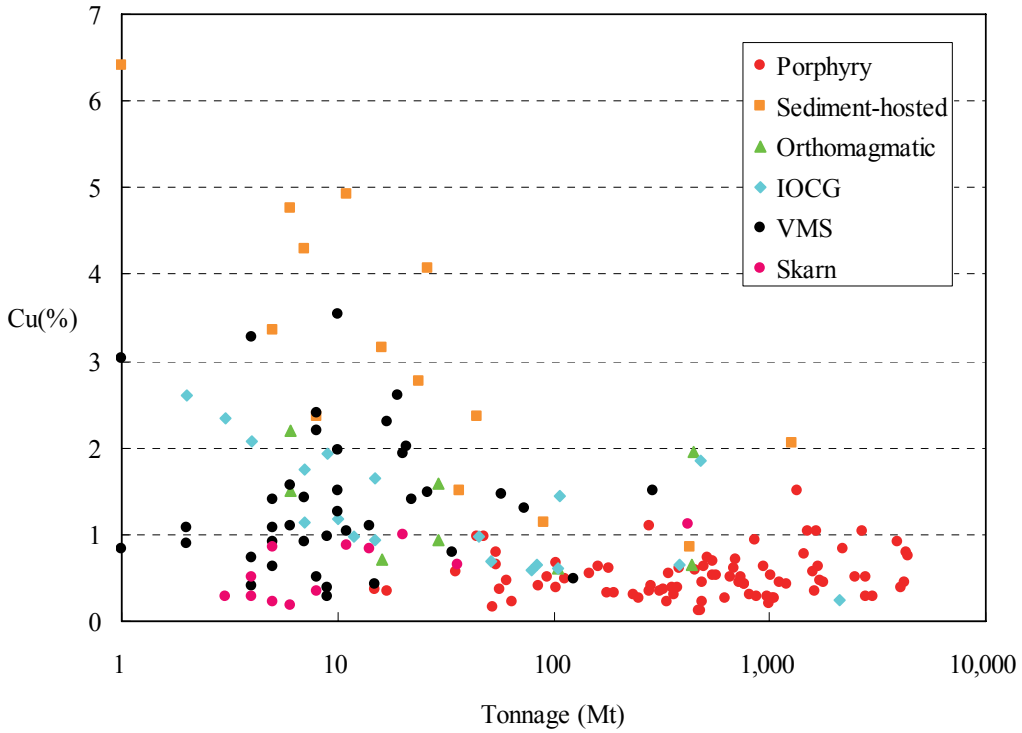
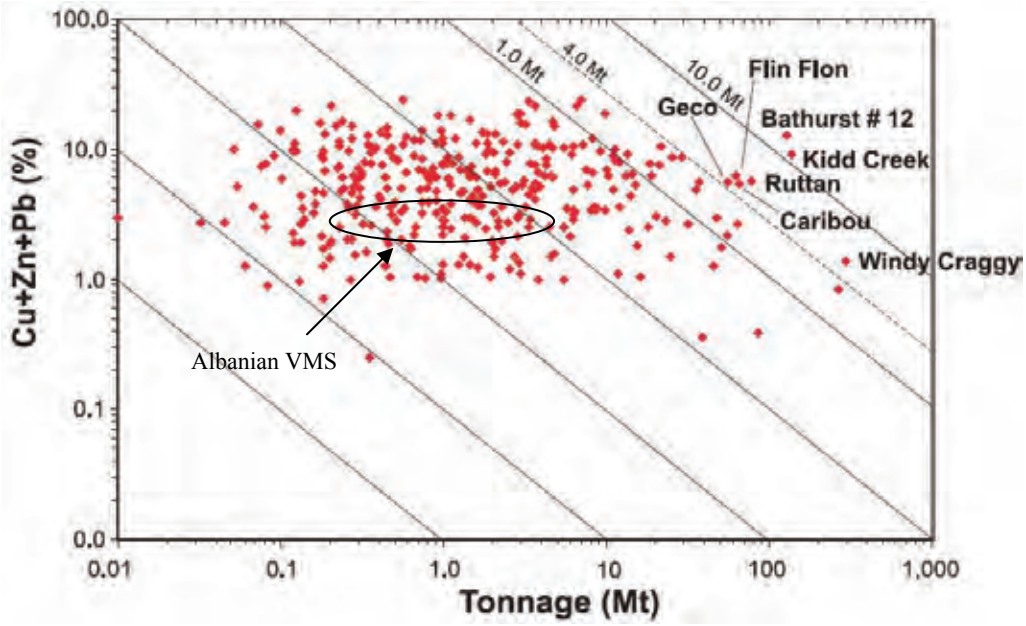


Figure 4.3.4 Grade-tonnage diagram of the world copper deposits

The largest copper deposit, with more than 100kt copper metal, discovered and developed so far in Albania is the Gjegjan deposits which had original geological resources of 5.28 million tons at 3% Cu (=Cu: 158kt) and followed by the Spaci deposit with 10 million tons at 1.1%Cu (Cu=110kt) and the others range from few hundred thousand to few millions tons at grade of 0.95 to 3.85Cu% (Hoxha et al., 2005). Accordingly the size of expected deposit in ophiolite of Albania might be tens of millions tons with 1-2%Cu at largest. Examples of the world class Kuroko deposits are Neves Corvo (270Mt, Portugal), Aljustrel (250Mt, Portugal), Rio Tinto (250Mt, Spain), La Zarza (164Mt, Spain), Horne (150Mt, Canada), Kid Creek (149.3Mt, Canada, Brunswick No.12 (137.3Mt, Canada) etc. Acidic volcanism in Albania is quite small scale compared with that of the world class deposits. Consequently the expected size of copper deposits in Albanian ophiolite zone is expected to be tens of million tons at the maximum. Albania copper deposits are plotted in the lower grade and smaller scale domain of Galley (2007) as shown in Figure 4.3.5. Differences between the Albanian VMS and the Kuroko and world large VMS are clear (Figure 4.3.6).

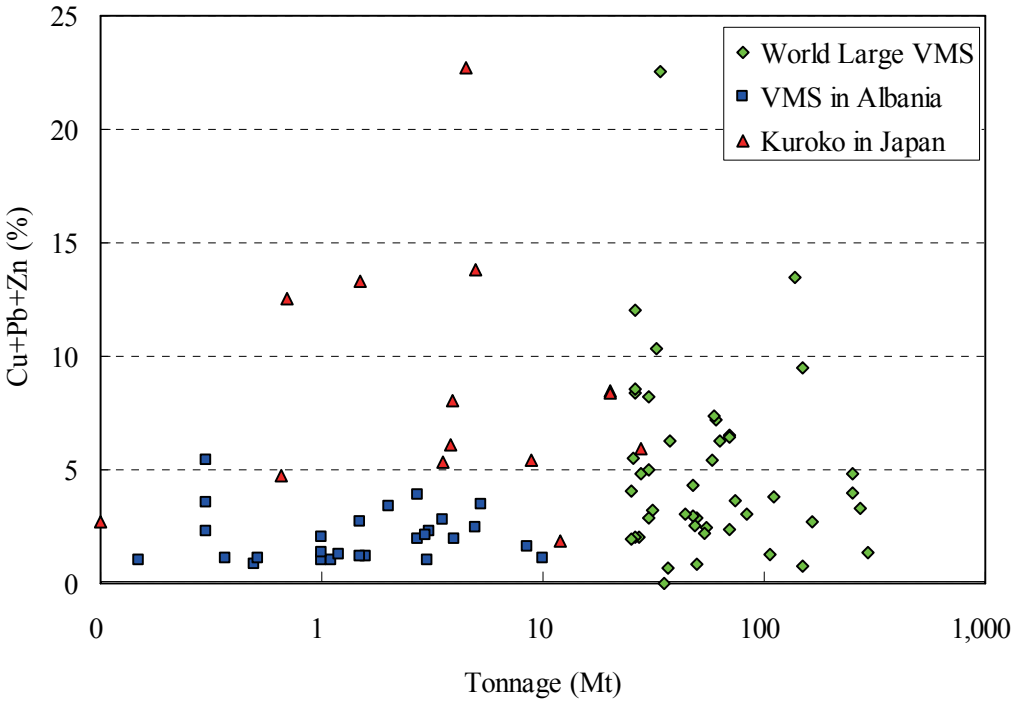
The most promising type of deposits and their occurrences in Albania are the “pseudo Kuroko” type despots and the Puka-Mirdita region which extends 50km in North-South direction and 10km in East-West direction. In the area, intermediate to acidic volcanic rocks are distributed closely associated with cluster of small but plenty of ore bodies (Figure 4.3.7).

The Munelle deposit is composed of many lenticular ore bodies in the mineralized zone. Unfortunately country rock of ore bodies is not described in detail, however it is assumed to be acidic volcanic rocks. Within the area, dome like massive parts were depicted which are thought to be domes or stocks of acidic rocks. Quartz or silica bed overlies on the sphalerite dominant ores. Chalcopyrite dominant ores underlies them. Pyrite ores occupy deeper and central zone (Figure 4.3.8). This kind of configuration of mineral zoning and host rock are quite similar to those of the Kuroko deposits. That is the reason why the deposits in the Puka-Mirdita region are considered as “the pseudo Kuroko” deposits. As a matter of course, more information for making clear comparison is needed.



(Galley et al., 2007)

Figure 4.3.5 Grade-tonnage-diagram of the world VMS deposits

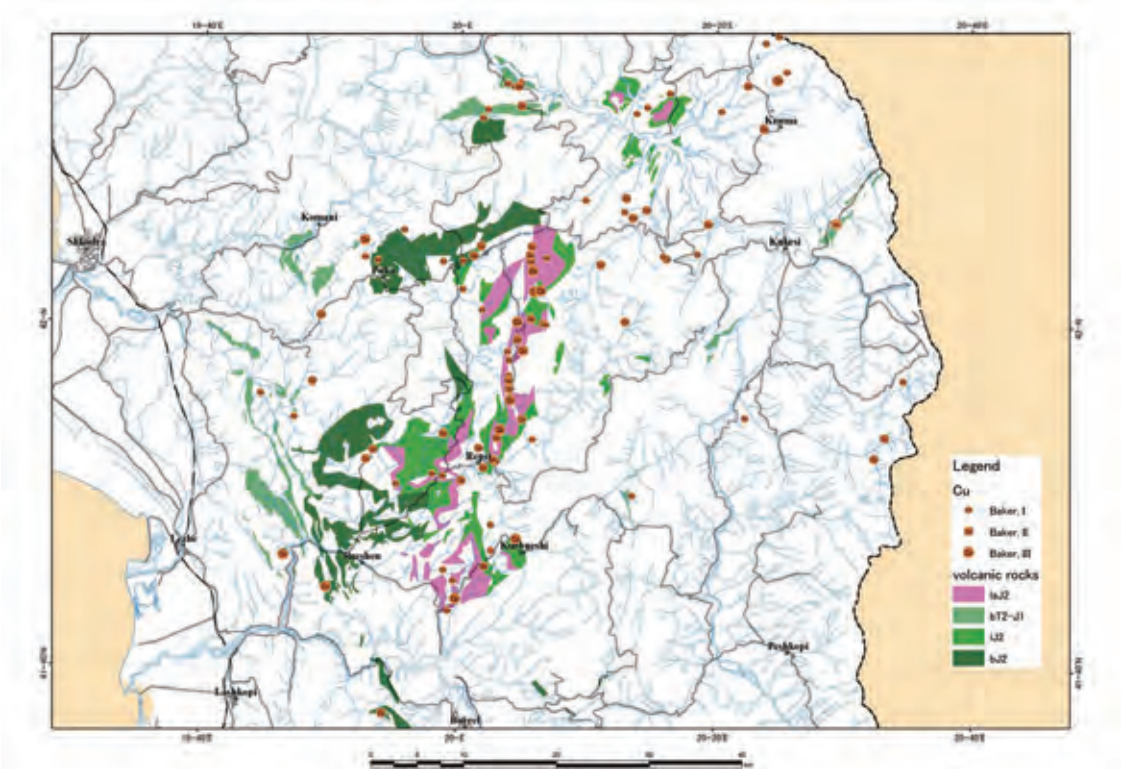


(World large VMS: Galley et al., (2007), Albania VMS: ITNPM and AGS (2005), Kuroko in Japan: Kubota et al., (2004))

Figure 4.3.6 Comparison of the world large VMS deposits, the Japanese Kuroko deposits and Albanian VMS deposits

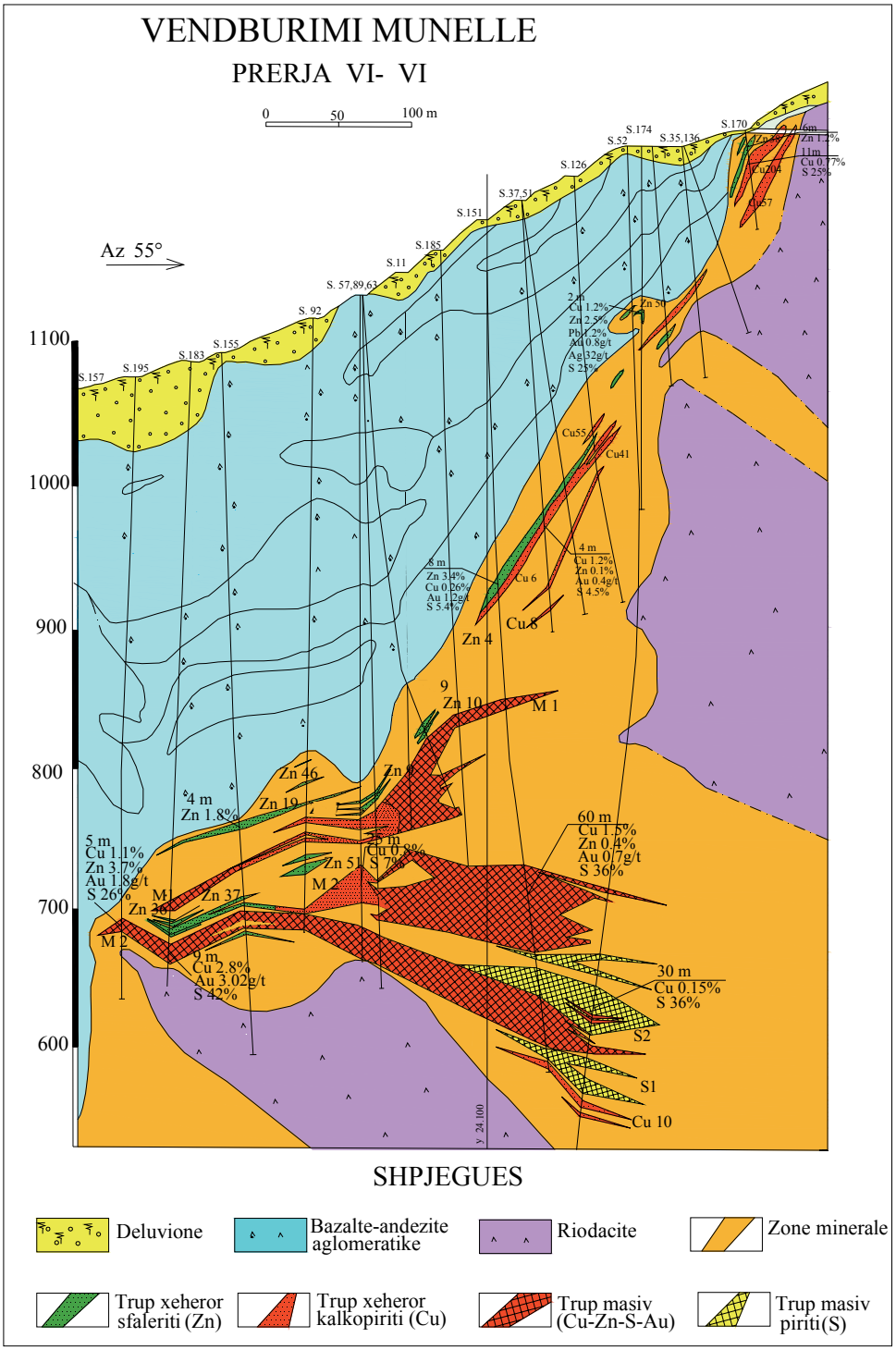
The following ore minerals are identified in the pseudo Kuroko deposit; pyrite, chalcopyrite, sphalerite, galena, pyrrhotite, markasite, pentlandite, chalcocite, coveline, arsenopyrite, bornite etc. It is impossible to compare chemical characteristics of ores with other VMS deposits due a lack of chemical analysis. However as shown in Figure 4.3.9, the "pseudo Kuroko deposits" in Albania are

characterized by lower Zn content compared with Kuroko deposits in Japan. But the TIREX's drill holes intersected high Zn (width: 3.4m, 2.4%Cu, 33.2%Zn) ore. More detailed data is necessary to make comparison more precisely.



(modified from AGS database)
green color: basic rocks, pink: acidic to intermediate rocks

Figure 4.3.7 Distribution of volcanics and VMS deposits in the northern part of Albania



(source: AGS)

Figure 4.3.8 Geological cross section of the Munelle deposit

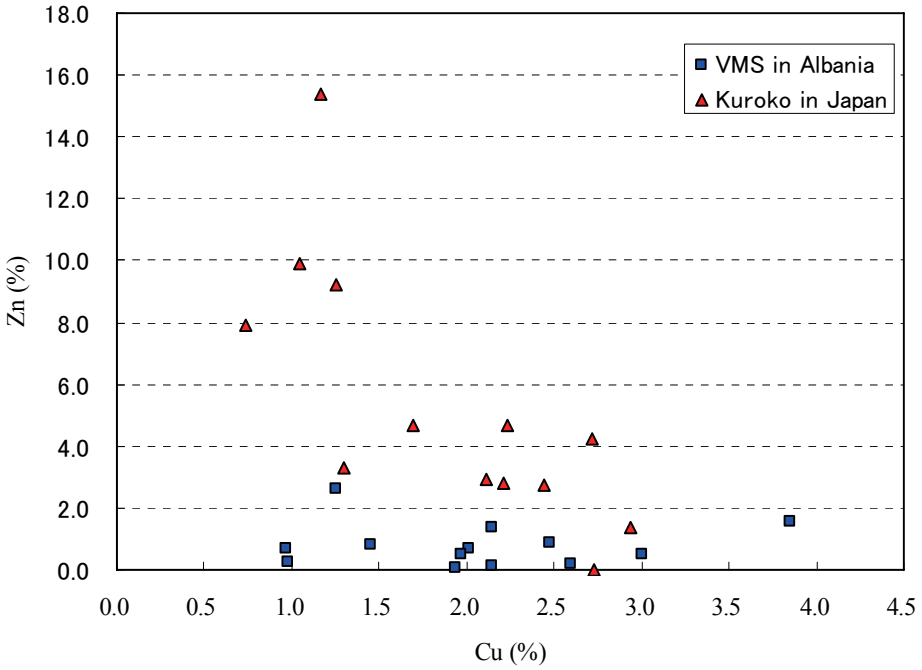


Figure 4.3.9 Cu-Zn diagram of VMS in Albania and Kuroko in Japan

4.3.5 Mineable Deposit Size

As shown in Table 4.3.5, a hypothetical copper mine called the Mirdita mine in Mirdita province was assumed and evaluation of the economical value was conducted. In the case, assumed conditions are: mineable ore reserve:3Mt, copper grade:1.8% Cu, CAPEX: 38MUS$, copper price:200 ¢ /lb, crude ore production:200 kt/a and operation term:15 years. NPV_{10} and IRR are calculated as 14.26MUS$ and 18.09%, respectively. However if copper price will drop to 175 ¢ /lb, NPV_{10} and IRR also will dropped to 3.52MUS$ and 12.11 %. Accordingly average copper price stay over 200 ¢ /lb, this kind of mine is profitable.

4.3.6 World Copper Supply and Demand

The mine supply and refined consumption of copper have increased at an exponential rate since early 20th century (Figure 4.3.10 and Figure 4.3.11). As shown in Table 4.3.6, many new copper mines will start operations. The recent increase in mine supply is mainly due to Chile and increase in refined copper consumption is due to mainly China. Owing to economic growth of China and other BRICs, refined copper consumption is forecasted to increase by some experts. Since 2004, the LME copper price has jumped and stayed at the high level (Figure 4.3.12), which is said to be some sort of the "super cycle", a trend of long term. Increasing refined copper consumption and keeping higher level copper price must be good circumstances to Albanian copper mining industry even if the size of copper deposits in Albania is smaller.

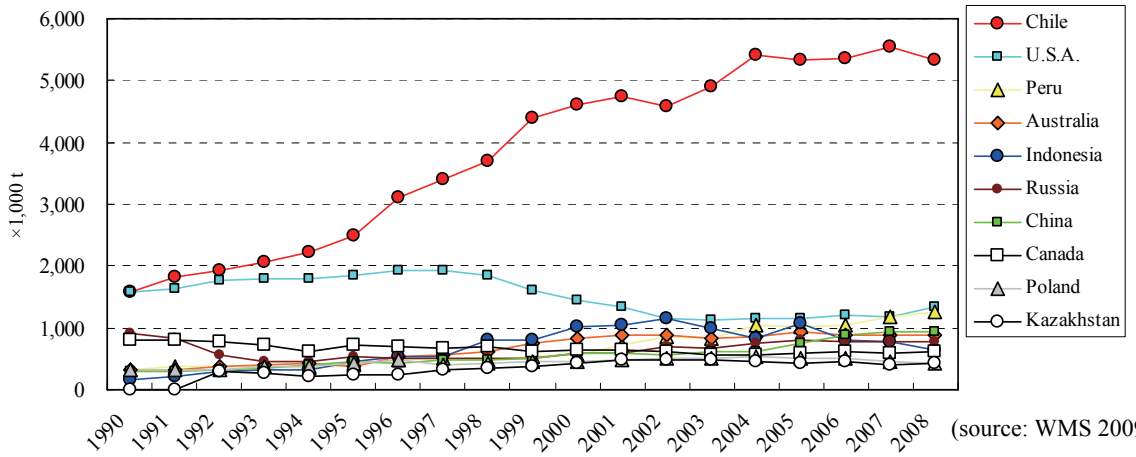
Table 4.3.5 Economical evaluation of the hypothesis mine " Mirdita Mine"

year				-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Basic conditions	Ore reserves																		
	Ore reserves		(kt)		3000	2800	2600	2400	2200	2000	1800	1600	1400	1200	1000	800	600	400	200
	Cu grade		(%)		1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
	Mining																		
	Underground ore treated	①	(kt/y)		200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
	Head grade	②	(%)		1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
	Beneficiation																		
	Cu Concentrate	③	(kt/y)		10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8
	Cu Grade	④	(%)		30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
	Cu in concentrate	⑤=③×④	(kt/y)		3.24	3.24	3.24	3.24	3.24	3.24	3.24	3.24	3.24	3.24	3.24	3.24	3.24	3.24	3.24
	% Payable Cu		(%)		96.3	96.3	96.3	96.3	96.3	96.3	96.3	96.3	96.3	96.3	96.3	96.3	96.3	96.3	96.3
	Smelting																		
	Cu recov.		(%)		95	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Cu TC	⑥	($/t)		50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
	Cu RC		(¢/lb)		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Conc.Feight	⑦	($/t)		30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
	Capex	⑧	($m)	32	0	0	0	0	0	2	2	2	0	0	0	0	0	0	0
	Starting		($m)	32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Mining		($m)	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Beneficiation		($m)	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Infrastructure		($m)	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Other		($m)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sustaining		($m)	0	0	0	0	0	0	2	2	2	0	0	0	0	0	0	0
	Corporate tax	⑨	(%)		30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
	Royalty	⑩	(%)		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Metal Price																		
	Copper		($/t)		4409.2	4409.2	4409.2	4409.2	4409.2	4409.2	4409.2	4409.2	4409.2	4409.2	4409.2	4409.2	4409.2	4409.2	4409.2
	Copper	⑪	(¢/lb)		200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
	Opearting cost (C to C)	⑫	($/t)		26.51	26.51	26.51	26.51	26.51	26.51	26.51	26.51	26.51	26.51	26.51	26.51	26.51	26.51	26.51
	Mining		($/t)		16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
	Labour		($/t)		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Energy		($/t)		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Consumable		($/t)		10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	Other		($/t)		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	Beneficiation		($/t)		8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
	Labour		($/t)		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	Energy		($/t)		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	Consumable		($/t)		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Other		($/t)		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	G & A		($/t)		3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51
	Labour		($/t)		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Energy		($/t)		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	Consumable		($/t)		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Other		($/t)		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Revenue	Gross revenue	⑱=⑯×⑰	($m)		13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8
	Cu price	⑯	(¢/lb)		200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
	Cu payable	⑰	(lbm)		6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9
DCF analysis	Gross revenue	⑱=⑯×⑰	($m)		13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8
	Operating costs	⑮=⑫×①	($m)		5.30	5.30	5.30	5.30	5.30	5.30	5.30	5.30	5.30	5.30	5.30	5.30	5.30	5.30	5.30
	Realization costs	⑲=⑬+⑭	($m)		0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
	Royalty	⑳=⑱×0.05	($m)		0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
	Net revenue after costs	⑱-⑮-⑲-⑳	($m)		6.90	6.90	6.90	6.90	6.90	6.90	6.90	6.90	6.90	6.90	6.90	6.90	6.90	6.90	6.90
	Depreciation		($m)		2.88	2.88	2.88	2.88	2.88	2.88	2.88	3.06	3.24	3.42	0.54	0.54	0.54	0.54	0.54
	Net revenue after depreciation		($m)		4.02	4.02	4.02	4.02	4.02	4.02	4.02	3.84	3.66	3.48	6.36	6.36	6.36	6.36	6.36
	Corporate tax		($m)		0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.19	0.18	0.17	0.32	0.32	0.32	0.32	0.32
	Net revenue after corporate tax		($m)		3.82	3.81	3.81	3.81	3.81	3.81	3.81	3.64	3.47	3.30	6.04	6.04	6.04	6.04	6.04
	+Depreciation		($m)		2.88	2.88	2.88	2.88	2.88	2.88	2.88	3.06	3.24	3.42	0.54	0.54	0.54	0.54	0.54
	Operating cash flow		($m)	0	6.70	6.69	6.69	6.69	6.69	6.69	6.69	6.70	6.71	6.72	6.58	6.58	6.58	6.58	6.58
	Capex		($m)	32	0	0	0	0	0	2	2	2	0	0	0	0	0	0	0
	Net cash flow		($m)	-32	6.70	6.69	6.69	6.69	6.69	4.69	4.69	4.70	6.71	6.72	6.58	6.58	6.58	6.58	6.58
	NPV	8%	($m)	-29.63	5.74	5.31	4.92	4.56	4.22	2.74	2.54	2.35	3.11	2.88	2.61	2.42	2.24	2.07	1.92
		10%	($m)	-29.09	5.53	5.03	4.57	4.16	3.78	2.41	2.19	1.99	2.59	2.36	2.10	1.91	1.73	1.57	1.43
		12%	($m)	-28.57	5.34	4.76	4.25	3.80	3.39	2.12	1.90	1.70	2.16	1.93	1.69	1.51	1.35	1.20	1.07
		15%	($m)	-27.83	5.06	4.40	3.83	4.16	2.89	1.76	1.76	1.34	1.66	1.44	1.23	1.07	0.93	0.81	0.70
		17%	($m)	-27.35	4.89	4.18	3.57	3.05	2.61	2.41	1.34	1.14	1.40	1.20	1.00	0.85	0.73	0.62	0.53
		20%	($m)	-26.67	4.65	3.87	3.23	2.69	2.24	1.31	1.09	0.91	1.08	0.90	0.74	0.61	0.51	0.43	0.36
		22%	($m)	-26.23	4.50	3.69	3.02	2.48	2.03	1.17	0.96	0.79	0.92	0.75	0.60	0.50	0.41	0.33	0.27
		24%	($m)	-25.81	4.35	3.51	2.83	2.28	1.84	1.04	0.84	0.68	0.78	0.63	0.50	0.40	0.32	0.26	0.21

IRR:18.09%
⑰:3.24*1000*(30-1.1)/30*2.2046*1000/1000000

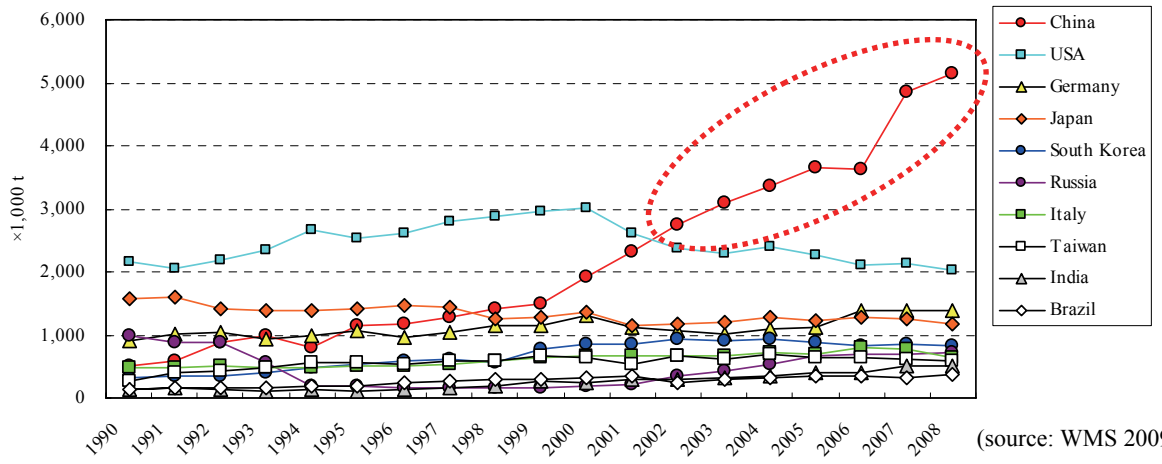
Table 4.3.6 World copper projects

Name	Country	Type	Reserves+Resources (mt)	Cu%
Pebble	USA	PO	3,029	0.28
Toromocho	Peru	PO	1,706	0.47
Aktogay	Kazakhstan	PO	1,614	0.35
Oyu Tolgoi	Mongolia	PO	1,511	1.04
Cerro Colorado	Panama	PO	1,457	0.77
Cerro Casale	Chile	PO	1,035	0.26
El Arco	Mexico	PO	1,016	0.52
Casino	Canada	PO	991	0.20
Quellaveco	Peru	PO	938	0.64
Schaft Creek	Canada	PO	817	0.30
Agua Rica	Argentina	PO	731	0.50
Panantza	Equador	PO	678	0.62
Geleno	Peru	PO	661	0.50
Conga	Peru	PO	618	0.26
Michiquillay	Peru	PO	544	0.69
Rio Blanco	Peru	PO	499	0.63
Rosemont	USA	PO	492	0.44
Prosperity	Canada	PO	487	0.22
Brisas	Venezuela	PO	483	0.13
El Morro	Chile	PO	450	0.58
Kingking	Philippines	PO	354	0.39
Namosi	Fiji	PO	344	0.54
Mount Milligan	Canada	PO	334	0.22
Florence	USA	PO	321	0.37
Red Chris	Canada	PO	276	0.35
Antucoya	Chile	PO	236	0.31
Minador	Equador	PO	180	0.62
Copper Mountain	Canada	PO	176	0.33
Skouries	Greece	PO	146	0.54
Rio Tinto	Spain	VMS	123	0.48
Magistral	Peru	PO	114	0.49
Alemao	Brazil	IOCG	106	1.45
Cerro Negro Chile	Chile	IOCG?	79	0.59
Jabal Sayid	Saudi Arabia	VMS?	74	1.30
Tambo Grande	Peru	VMS	58	1.46
Los Chancas	Peru	PO	54	0.80
Roseby	Australia	IOCG	51	0.69
New Afton	Canada	PO	44	0.98
Buenavista	Mexico	Skarn?	36	0.65
Didipio	Philippines	PO	35	0.56
Bisha	Eritrea	VMS	20	1.94
Aljustrel	Portugal	VMS	15	0.42
Kinsenda	Congo D.R.	SED	11	4.92
San Martin	Mexico	Skarn	11	0.87
Camacks	Canada	VMS	11	1.04
Sulphur Spring	Australia	VMS	10	1.50
Khadiza	Uzbekistan	VMS	9	0.97
Kalukundi	Congo D.R.	SED	8	2.37
Shituru	Congo D.R.	SED	7	4.30
Al Masane	Saudi Arabia	VMS	7	1.42



(source: WMS 2009)

Figure 4.3.10 World copper mine production by country



(source: WMS 2009)

Figure 4.3.11 World refined copper consumption by country

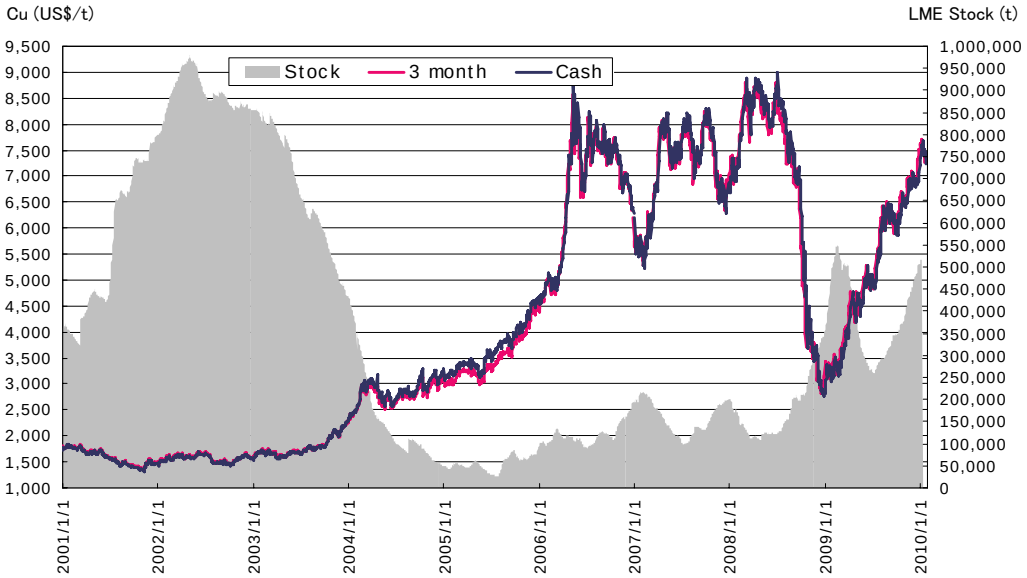


Figure 4.3.12 LME copper price and stock

4.3.7 Issues to be considered in Copper Mining

It goes without saying that although there are plenty of VMS deposits in Albania, the probability of existence of the world class deposits is very low compared with in the area of other metallogenic provinces of VMS such as Canada, Portugal and the Ural. However copper deposits in Albania are one of the important natural resources to be used for economical diversity. In this section, issues existing in each process of mining are considered and, in the next section, some strategies of copper mining including direction and methodology are proposed in order to breakthrough the current impasses.

1) Exploration -to increase reserves with higher grade

The key issue in the Albanian copper mining is that mineable reserves are too small in spite of abundant deposits being discovered (Table 4.3.7). The Albanian government carried out systematic exploration during the planned economic regime, but both of the methods and exploration models applied were old.

Table 4.3.7 Remaining copper reserve

Group	Mine or Deposit	Resource (t)	Cu %	Cu (t)	Value (million US$)*	Mining Concession Owner
New Deposit	Bregu i Geshtenje	1,037,340	1.86	19,295	135	
	Perlat	754,745	2.44	14,038	98	
	Karme	517,295	2.24	9,622	67	BERALB
	Lak Roshi	317,246	3.94	5,901	41	BERALB
	Munelle	5,145,620	1.05	95,709	670	BERALB
	Tuci Indor	500,994	1.5	9,318	65	
	Gurth 3	121,356	2.11	2,257	16	
Existing Mine**	Nikoliq 1	170,000	1.2	3,162	22	
	Krume	43,000	3.55	800	6	
	Cafe Bari	330,000	1.45	6,138	43	
	Fushe Arrezi	39,600	2.42	737	5	
	Spaci	3,274,200	0.984	60,900	426	Tete Mining
	Gurth 1	55,462	2.28	1,032	7	
	Rhehove	216,000	1.464	4,018	28	Dedeman Mining
Closed Mine***	Golaj	429,630	0.602	7,991	56	
	Munelle	603,626	1.43	11,227	79	
	Tuci	462,869	0.85	8,609	60	
	Porave	48,062	2.11	894	6	
	Rruga e rinise	387,805	1	7,213	50	
	Kcire	126,339	1.45	2,350	16	
	Paluce	2,356,000	1.49	43,822	307	
	Gurth 2	227,040	1.14	4,223	30	
	Thirre	333,752	1.70	6,208	43	
	Rubic	968,570	2.01	18,015	126	
	Kacinar	126,339	1.45	2,350	16	
	Kurbnesh	-	-	-	-	
	Perlat 1	236,275	1.68	4,395	31	
	Dereven	1,248,558	0.98	23,223	163	
	Kullaxhi	372,592	1.06	6,930	49	
	Gdheshte	197,000	1	3,664	26	
	Shemeri	403,500	0.85	7,505	53	
	Gjegjan	61,000	2.56	1,135	8	
	Nikoliq 2	560,051	2.3	10,417	73	
Total		21,671,866	1.86	403,097	2,822	

*Value: LME US$7,000/t

* *classified as an existing mine by AKBN, however actually no operation

*** resource of closed mine is geological reserve of AGS classification

(source: AKBN)

Various information including field evidences suggest that the volcanogenic massive sulfide deposits in the Puka-Mirdita region, which is characterized by supra-subduction zone (SSZ) volcanism, is quite similar to the Kuroko deposits in the world. The TIREX, Canadian junior mining company, started exploration with the concept model taken from the Noranda VMS deposit and implemented airborne geophysics. The modern analogue of SSZ of the Albania, related to subduction in intra-oceanic environment, is the Izu-Ogasawara arc where submarine hydrothermal deposits are actually being formed, which are thought to be proto type of the Kuroko deposits. By making comparison with well known Kuroko deposits in Japan, precise evaluation of potentiality of massive sulfide deposits in the Puka-Mirdita region would be possible. Furthermore, modern exploration techniques like lithogeochmistry and bore hole geophyics, that were very effective to discover the blinded ore bodies of Kuroko deposits in Japan, are recommended to be carried out in Albania. The "pseudo Besshi" type deposits like the Gjegjan deposits contains high grade copper. However, as mentioned earlier, if it is mélange as interpreted by many geologists, potentiality of finding this type of deposit is considered to be difficult. It is, therefore, necessary to review all copper deposits in Albania again based on world standard models.

2) Mining -to increase ore recovery and decrease operation cost

Like the Kuroko deposits in Japan, almost all VMS deposits in Albania are concealed few hundred meters below surface and show irregular forms. The mining methods applied and currently being applied are sub-level caving which was thought to be the most economical method to the Albanian VMS. In general, sub-level caving method is suitable for development of large massive deposit, like the Kiruna, Sweden and it is said that it has some demerit such as high ratio of waste and difficulty of selection of faces. It is necessary to study optimal mining method with higher recovery and lower cost. It is recommended that efficient excavation and beneficiation technologies applying to small scale deposits of low economical value and recovering remaining metals in tailings should be considered. For these, a concept of the "compact mining system" advocated by Yamatomi (University of Tokyo) may be applicable.

3) Beneficiation -to increase mineral recovery and recovery of other minerals

Ore minerals of the "pseudo Kuroko deposits in Puka-Mirdita region are fine grained and consisted with chalcopyrite, pyrite, sphalerite and etc. consequently mineral separation is difficult and as a result only copper has recovered. Recovery rate of copper concentrate was low, 85% at maximum. The recovery rate of the Fushe Arrezi beneficiation plant currently operating by BERALBA is 85% and Cu grade of concentrate is 19%. It should be improved up to over 90% like the Kuroko ore in Japan. Although in the past only copper was recovered, it is desirable to consider recovering zinc as well at the plant.

4) Feasibility of smelting in Albania

During the planned economic regime two smelters and refineries (Rubic and Laci) and one smelter (Kukes) produced cathodes. However these plants were small and produced, at largest, 10,000t/a en bloc. Currently there is not any operating smelting plant in Albania. Considering current mineable reserves not only in Albania but also neighboring countries, constructing new smelting and refinery plants in Albania is not recommended. Even small scale custom smelter is not profitable (Table 4.3.8).

Table 4.3.8 Construction and operation cost of small scale smelter and refinery

(Research Institute data)

	Capacity	CAPEX	TC	RC	Cost	Revenue	Balance
Smelter	20,000t/a	60M$	60$/t conc.		30 ¢ /lb[*1]	19 ¢ /lb[*3]	-11 ¢ /lb
Refinery	20,000t/a			6 ¢ /lb metal	8 ¢ /lb[*2]	10 ¢ /lb[*4]	2 ¢ /lb

[*1] average of small scale 5 smelter
[*2] average of small scale 5 refinery
[*3] TC:9.5 ¢ /lb, bonus 4.5 ¢ /lb, sulfer credit 5 ¢ /lb, 28.5%Cu
[*4] RC:6 ¢ /lb, Premium:5.5 ¢ /lb, freight:1.5 ¢ /lb

5) Environmental treatments –development of environmental load zero mine

The VMS deposits is polymetallic and rich in sulfide minerals such as pyrite, chalcopyrite, sphalerite, galena, arsenopyrite etc. compared with chromite and lateritic nickel ore. Moreover sulfide minerals produce sulphuric acid by oxidation and then semi-permanently acid water might seep. It is necessary to take measures of environmental treatment not only during operation but also after closing mines. When the government grant exploitation licenses to the owners of the concession, the government should be obliged them to take measure for environmental treatment after closing mine and confirm necessary funds to avoid problems remaining in many closed mines and beneficiation plants in Albania.

6) Player of the copper mining -well financed and skilled enterprise-

Mining of VMS deposits needs more technology and investment compared with lateritic nickel and chromite mining and as a consequence it would be difficult to be operated by domestic mining companies by themselves. No major mining companies are expected to have interest in copper mining in Albania. Foreign enterprise, especially junior mining companies and or small companies who are not listed on the major markets might be necessary for conducting mining operation. Development of mining technology of domestic mining enterprise and employment of local engineer and stuff are also necessary.

7) Knowledge of mineral deposits and know-how of exploration technologies –ability to communicate with the world exploration companies

During the planned economic regime, AGS employed plenty of exploration specialists and implemented exploration with higher level knowledge and technology, however they became older and left from AGS due to retirement or reduction in force. Currently most of the geologists in AGS are engaged in production of geological maps and data-base. Thereafter economic geologists and exploration geologists are too scarce. Moreover they lack the ability to evaluate mineral potential by the world standard scheme and to introduce mineral potential of Albania to the world investors.

4.3.8 Strategies for Development of Copper Resource

Based on discussion described above, the following strategies for development of copper resources are proposed.

1) Direction to pursue

The copper deposit in Albania is classified as the volcanogenic massive sulfide deposits and existence of few ten kilo tons of copper bearing deposits are expected. To encourage copper mining for future in Albania, “Finding mineable copper resources” and “Efficient recovery of copper from the existing small mines and tailings” are recommended. Further in addition to above two, “Strengthen mutual interface between AGS and university” is recommended.

According to forecast of research organizations of the world, consumption of copper will increase due to economic growth of newly industrializing counties and copper price will remain the level of late 2010s. These circumstances are good for Albanian copper mining. Appropriate copper mining development will surely contribute to the economic growth of Albania.

Since copper mine operation by only domestic mining companies are thought to be difficult because underground mining of sulfide deposits needs higher level of mining, beneficiation and environment technologies, it is desirable to be operated by experienced foreign companies.

Because a small custom smelter will not be efficient and would not be competitive in the international market, and moreover stable supply of copper concentrates will be insufficient judging from potentiality of not only Albania but also neighboring countries, it is not recommended to build a smelter and refinery in Albania.

2) Methodology

A. Finding mineable copper resources

It is urged to discover mineable deposits in order to encourage copper mining industry in Albania. As copper deposits in Albania are hosted in ophiolite, consequently target area is restricted to volcanic and plutonic members. Considering the existing data and information, the following promising areas are recommended:

-the area of acidic volcanics (SSZ ophiolite zone shown as I in Figure 4.3.13) from Fushe Arrezi to Spaci as the first priority
-basaltic rock area from Rubik to Puke (MORB ophiolite zone shown as II in Figure 4.3.13), -
-the eastern part of northern Albania (around the Gjegjan mine shown as III in Figure 4.3.13) -
-southern part of Albania (around the Rehove mine shown as II in Figure 4.3.13).

As a basic survey, the airborne geophysics and satellite image analysis should be applied to delineate promising areas. Demagnetized and argillic alteration zones will be targets for further exploration.

In order to characterize the volcanogenic massive sulfide deposits in Albania and to establish empirical local model, world volcanogenic massive sulfide deposits and their published genetic models should be reviewed by AGS in cooperation with staff of the Faculty of Geology and Mining and Geosciences Institute of the Polytech University of Albania. Newly developed empirical local model should be examined using the information of Archive Center of AGS. Using results of these together with the results of airborne geophysics and satellite image analysis, selection of promising areas which should be recommended to foreign investors is made. The airborne geophysics and satellite image analysis are so expensive that it will take time to realize. Re-analysis of the existing data in the Archive Center is recommended to start as soon as possible without considering the airborne geophysics and satellite image analysis.

Regarding the existing data analysis and formulation of empirical local model, working procedures are shown as below.

(a) To understand the characteristics of the typical Cyprus, Kuroko and Besshi type deposits and to formulate general concept model of each volcanogenic massive sulfide deposits: Useful information could be obtained from the following published data; Geology of Kuroko Deposits (Special Publication No.6, 1976, Society of Mining Geologist of Japan), Mineral Deposits Profile (B.C. Geological Survey, Canada) and Volcanic Associated Massive Sulfide Deposits (Review in Economic Geology, Volume 8, 1999, Society of Economic Geologist).
(b) To formulate local empirical model based on paper and text on the volcanogenic massive sulfide deposits in Albania and neighboring countries: This can be done by modification of the general concept model mentioned above.

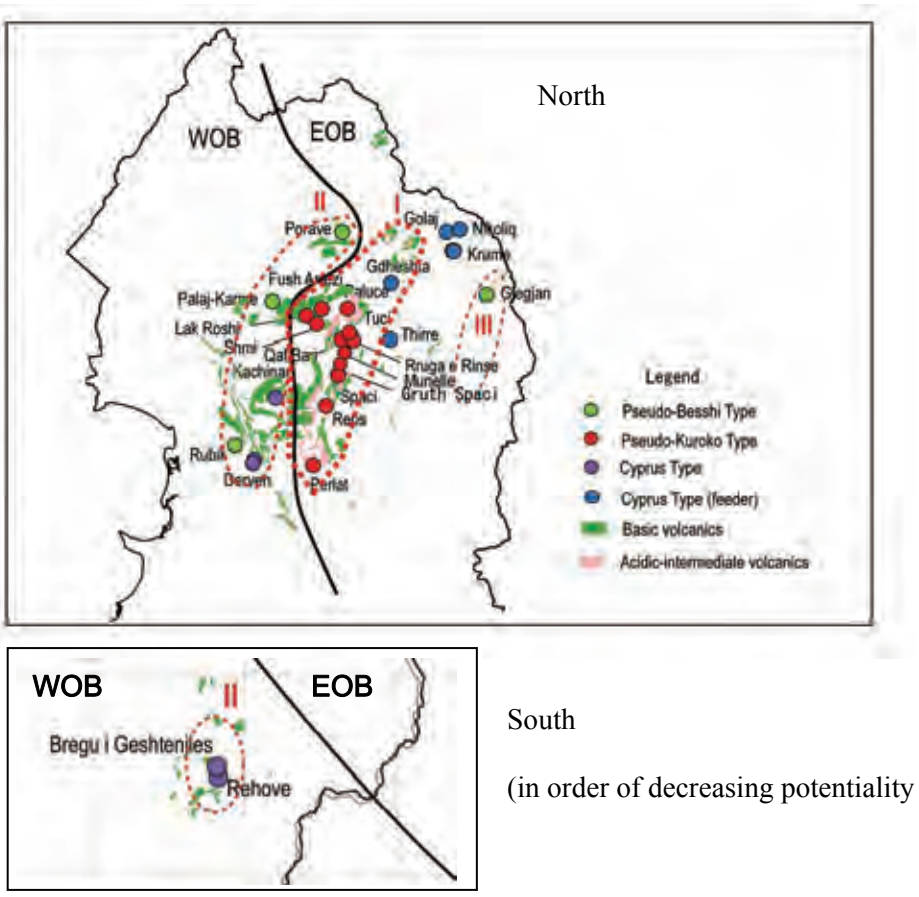
(c) To analyze and evaluate the following items by comparison with local empirical model:
/ Understanding original rock types of altered rocks and their original features.
/ mineral zoning, history of volcanic activity, mineralization and alteration to the original setting.
(d) To understand volcanic activity and mineralization and select promising areas.

Function of the Mineral Resources Department of AGS is consisted of re-evaluation of previous geological survey and exploration, elaboration of criteria and basic principals of extension of deposit and supplying geological information to investors. Recommendations described above are all included in the function of AGS and they can be conducted within the function of AGS. Currently they are conducting project II-3 and II-5 (formulating data base and evaluation of unevaluated ore deposits). By adding tasks of formulation of empirical local model and re-evaluation of existing data proposed by the study to the current projects, basic data for selection of prospective areas will be completed.

Some of the data will be output through web sites for encouraging foreign investments. When the government holds tendering for exploration license, survey cost of the above tasks should be included to bidding prices to recover the expenditure. AGS should not necessary to release all data, but only abstract of the contents, and original data and the result of the analysis can be sold.

In line with advances of work, it is recommended for AGS to launch a special campaign such as workshop to invite foreign investors.

Participation to the international program such as IGCP-52 (Global Comparison of Volcanic-hosted massive sulfides, organized by Rodney Allen) is recommended for not only strengthening ability of information acquisition, but also presenting information of the copper potentiality of Albania to foreign countries for attracting world concern.



(in order of decreasing potentiality from I to III)

Figure 4.3.13 Promising region of copper deposits

B. Re-evaluation and efficient development of known small sized deposits including remaining valuable metals in tailings.

Although plenty of small deposits are known, many of them are not exploited or closed without complete exploitation (Table 4.3.7.) Although mine operation is not a function of the government, for making best use of valuable resources, AKBN should take measure for the efficient recovery methods. Specifically based on the reserve estimation carried out during the planned economic regime, rough economical evaluation should be conducted for each deposit by the international standard. Then, by the concept of the compact mining system (compensate scale demerit by small, high efficiency and high recovery mining system to combined plural small sized deposits), development of small scale mining operation should be considered. The idea of the compact mining system is also applicable to small nickel and chromite mines. It is also recommended for AKBN to conduct pre-feasibility study for recovery of valuable metals from tailings dams instead of private companies and then entrust recovery work to private companies.

AKBN also should advise to the operating mines for optimum mining methods such as underhand cut and fill instead of sublevel caving, and optimum beneficiation method such as usage of hot water and SO_2 in order to raise recovery rate. Excavation of only high grade ore and un-recovery of contained valuable metals should be avoided for preventing loss of national treasury.

4.4 Nickel

4.4.1 Overview of the Nickel Mining

Nickel deposits in the eastern part of Albania are fossilized lateritic nickel deposits formed from the Cretaceous to Paleogene and constitutes a part of the metallogenic province of the Balkan lateritic nickel deposits that extends from Turkey to Serbia via Macedonia Albania and Kosovo. Albanian nickel deposits are distributed in clusters consisting of Kukes, librazhd-Pogradec and Devolli as shown in Figure 4.4.1. Total geological resources of nickel deposits are estimated to be around 300Mt with 1.01% Ni as shown in Table 4.4.1. Compared with other lateritic nickel deposits in the world, Albanian nickel deposits are small to medium size, and relatively low grade. Nickel ores are consisted with limonitic ore (called Fe-Ni ore in Albania) and saprolite-garnierite ore (called Ni-Si ore in Albania). Librazhd-Pogradec cluster is dominated with Fe-Ni ore and Kukes and Devolli clusters are rich in Ni-Fe ore.

During the planned economy regime, the Albanian government erected the plant of CARON method in the Elbasan steel complex and produced nickel metal and oxide cobalt from 1978 to 1986. However due to the technical obstacles, production did not go well in accordance to plan. They implemented laboratory test of pyro-metallurgy at the Elkem, Norwegian metallurgical company. Technologically it turned out to be possible, however the idea have not implemented to the Elbasan plant so far.

At the end of 2009, eleven Albanian mining companies and one Macedonian company were operating nickel mines in small scale in the three clusters. They produced 95kt of nickel ore with 1% Ni and then export them to smelters in Kosovo and Macedonia. Currently neither nickel metal nor interim product of nickel is produced in Albania. Joint venture of European Nickel and Balkan Resources has been conducting pre-feasibility study aiming to recover nickel mainly by the method of heap-leaching.

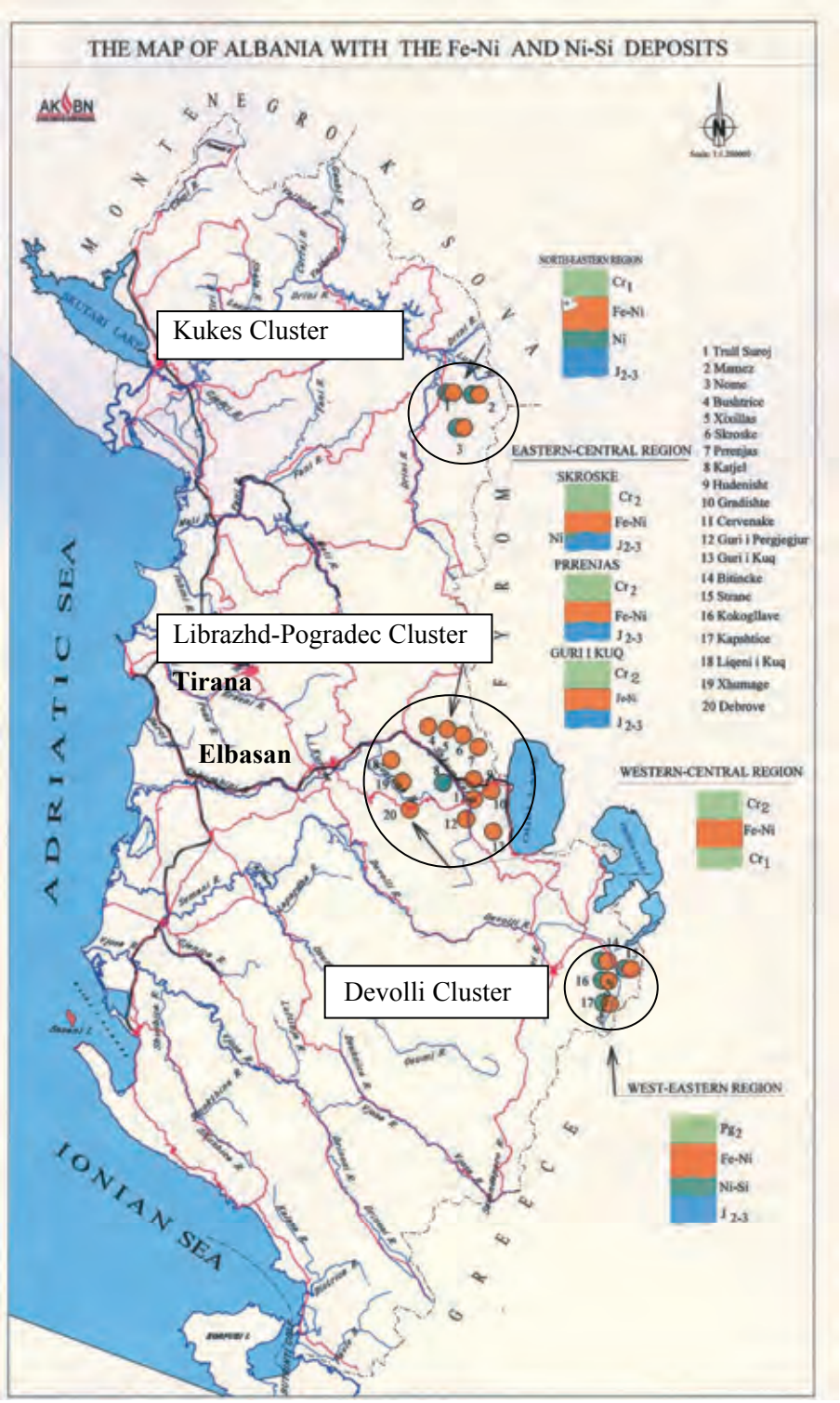
Neighboring countries such as Kosovo, Macedonia and Greece have been operating nickel smelters. It is desirable to invite foreign mining companies for mining operation and extracting nickel in Albania in order to add value to the raw materials. Otherwise, there is alternative to keep position of only exporting nickel ores to the neighboring countries as the case now stands. In order to invite foreign investment, it is thought to be necessary to make up more basic information regarding the characteristics of ores and establish conceptual models for extraction of nickel in Albania by the government.

4.4.2 Past Production

In the period of planned economy regime, lateritic nickel deposits, especially Fe-Ni type deposits such as the Prrenja and Gur i Kuq mines in the Librazhd-Pogradec cluster were excavated, and the ores were transported to the Elbasan Steel Complex and smelted. The infrastructure around the large Prrenja and Gur i Kuq deposits was relatively good because they were located close to the national road, European road E852, railroad and settlements. Old facilities such as mine shafts and beneficiation plants can be observed from the national road. In the yard of Pogradec station lateritic nickel ores are piled up. Most of mines excluding the Cervenak were underground. According to information from AKBN, around 18 million tons of lateritic nickel ores was excavated from late 1950's to 1991 (Figure 4.4.2). Before start operation of the nickel plant in Elbasan, they exported lateritic nickel ore to the Eastern Europe. During this period lateritic nickel ores of Ni-Si type of the Kukes and Devolli clusters were not mined due to a lack of metallurgical technology for this type of ore in Albania. The production of lateritic nickel ore re-started operation in 2005 in the Kukes, Librazhd-Pogradec and Devolli clusters, respectively.

In the Elbasan steel complex, electric nickel and oxide cobalt were produced from 1981 to 1992 by the CARON process which was constructed with Chinese materials and technology. However as shown in Table 4.4.2 production was limited to only 3,500 tons of electric nickel due to higher cost, low

operational rate and insufficient supply of raw material. By the smelting test carried out by Elkem, Norwegian company, it turned out to be optimistic to recover ferro-nickel from Ni-Si ores supplied from Devolli and Kukes clusters. Construction cost of a smelting plant in Elbasan was also estimated to be around 3.6 million US$ at that time (ITNPM and AGS, 2005). However this idea has not yet been put in practice so far.



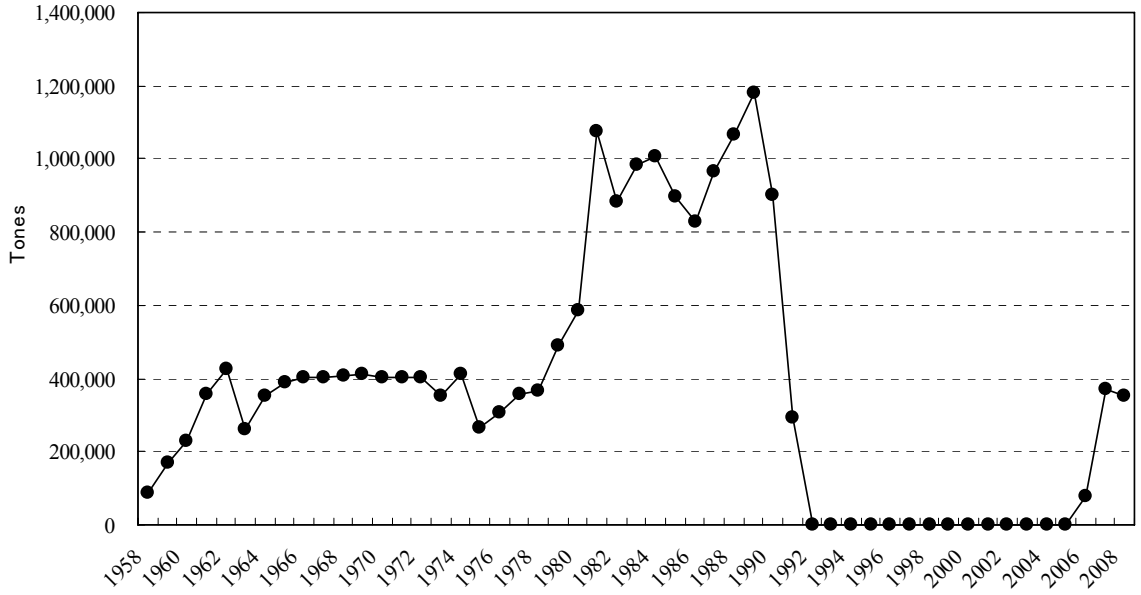
(source: AKBN)

Figure 4.4.1 Distribution of lateritic nickel deposits in Albania and their stratigraphy

Table 4.4.1 Major lateritic nickel deposits in Albania

Cluster	Name	Type	Mineral Resource (t) ($B+C_1+C_2$)	Ni (%)	Fe (%)	SiO_2 (%)	Co (%)
Kukes	Mamez	Fe-Ni	19,053,000	1.10	35.60	27.00	0.06
		Ni-Si	24,751,000	0.99	18.20	42.00	0.04
		total	43,804,000	1.04	25.77	35.48	0.05
	Nome	Fe-Ni	2,074,000	0.85	43.30	12.90	0.05
		Ni-Si	3,949,000	1.20	21.80	41.00	0.05
		total	6,023,000	1.08	29.20	31.32	0.05
	Trull-Surroj	Fe-Ni	6,382,000	0.96	33.30	17.30	0.06
		Ni-Si	24,120,000	0.95	22.40	39.40	0.05
		total	30,502,000	0.95	24.68	34.78	0.05
	Total in Kukes	Fe-Ni	27,509,000	1.05	35.65	23.69	0.06
		Ni-Si	52,820,000	0.99	20.39	40.74	0.05
		total	80,329,000	1.01	25.61	34.90	0.05
Librazhd-Pogradec	Bushtrice	Fe-Ni	1,283,500	1.06	49.47	6.00	0.06
	Gur i Kuq	Fe-Ni	53,178,976	0.97	41.84	16.80	
	Gradisht	Fe-Ni	252,870	0.71	45.81	4.10	
	Hundenisht	Fe-Ni	2,562,301	0.82	49.20	4.57	
	Debrove	Fe-Ni	4,000,000	0.85	27.90	33.60	0.05
	Xhumage	Fe-Ni	20,096,000	0.68	35.70	25.60	0.05
	G. Pergjegjur	Fe-Ni	1,414,419	0.99	48.55	5.94	
	CJ Lindore	Fe-Ni	5,102,184	0.95	44.50	12.30	
	Liqueni I Kuq	Fe-Ni	12,260,000	0.58	39.40	18.90	0.05
	Prrenjas	Fe-Ni	23,870,000	1.01	46.70	10.23	
	Skroske	Fe-Ni	14,547,900	0.99	50.04	3.89	0.07
	Xixillas	Fe-Ni	2,199,750	1.03	48.40	5.40	0.07
	Total in Librazhd-Pogradec	Fe-Ni	140,767,900	0.90	42.50	15.47	
Devolli	Strana	Fe-Ni	3,093,810	1.11	44.46	10.40	0.06
		Ni-Si	6,405,690	1.27	12.85	37.65	0.04
		total	9,499,500	1.22	23.14	28.78	0.05
	Bitincke	Fe-Ni	20,952,000	1.03	40.55	9.61	0.04
		Ni-Si	15,285,000	1.21	14.88	35.58	0.05
		total	36,237,000	1.11	29.72	20.56	0.04
	Kapshtica	Fe-Ni	24,592,000	1.25	43.00	10.00	0.04
		Ni-Si	16,639,000	1.19	19.00	34.35	0.04
		total	41,231,000	1.23	33.31	19.83	0.04
	Kokogllave	Fe-Ni	1,546,170	1.07	42.34	9.61	0.04
		Ni-Si	1,731,660	1.46	14.59	35.57	0.05
		total	3,277,830	1.28	27.68	23.32	0.04
	Total in Devolli	Fe-Ni	50,183,980	1.14	42.05	9.85	0.04
		Ni-Si	40,061,350	1.22	16.25	35.40	0.04
		total	90,245,330	1.18	30.60	21.19	0.04
Total in Albania			311,342,230	1.01			

(source: AKBN)



(source: AKBN)

Figure 4.4.2 Lateritic nickel ore production in Albania

Table 4.4.2 Nickel production in the Elbasan complex from 1981 to 1992

(tonnes)

Product	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Ni ore	328,821	323,417	361,022	457,572	398,700	377,730	409,400	426,532	451,770	428,164		
$NiCO_3$	2,313	2,412	3,076	3,755	3,145	3,169	3,311	3,237	5,183	4,316		
Anode Ni							88	694	2,500	2,650	1,100	63
Erectric Ni									1,747	1,608	170	
Oxide Co										0.2		

(source: AKBN)

4.4.3 Current Activity of Nickel Mining

After long dormant of mining operation and exploration since 1993, operation of nickel mines started again in 2005 in Devrova（F-Ni）and Skroska (Fe-Ni) mines of the Librazhd-Pogradec cluster, Bitincke (Ni-Si) and Kapshitica (Ni-Si) mines of the Deveoll cluster, and Trull (Ni-Si) and Suroj (Ni-Fe) mines of the Kukes clusters. Except for the new mine, Devrova, these are restarted mines which private companies acquired new licenses under the new mining law of 1994. As of December 2009, 30 companies are registered for mining licenses of nickel (Table 4.4.3). Exploitation license is 30, exploration license is 6 and prospecting license is 2. Among them foreign companies are: Macedonia: 2, Canada:1, UK:1, and China:1.

1) Exploration

The mode of occurrence of lateritic nickel deposits in Albania is simple, showing stratified layer and the grass root exploration is not normally conducted. Currently Adriatic Nickel, a subsidiary of European Nickel and Balkan Resources, Canadian junior mining company, acquired exploration licenses in the Devolli region and established joint exploration company, Devolli Resources, and they have been conducting advanced stage exploration at Kokogllave and Devolli area. According to their pre-feasibility sturdy, which is to be completed by the end of 2010, their target is successful heap

reaching of the mined ore near the mine site or transporting crude ore to the Greece smelter. JORC compliant resource estimations of Devolli is 35.6Mt at an average grade of 1.2% Ni and other resources estimates are: 26.4Mt at an average grade of 1.21% Ni for Balkan's Kokogllave and 37Mt at an average grade of 1.21% Ni for Balkan's Zemblaku. In the south western part of Albania, the lakes of Ohrid and Prespen are distributed crossing over the border of Albania and Macedonia and there is chorus of concern regarding usage of sulphuric acid for the heap leaching.

Balkan Resources have carried out drilling at the Librazhd-Pogradec cluster and discovered a new layer of lateritic nickel in the conglomerate strata occurring beneath the known lateritic nickel horizon. Unfortunately it was too thin to mine.

Table 4.4.3 Mining licenses of nickel

2010.01.01

Mine	Company	Region	License	Category	Coverage(km^2)	Country
Bitincke	A & F Nickel	Devolli	400, 17.04.1998	Exploitation	0.15	Macedonia
Bitincke	A & F Nickel	Devolli	572, 01.09.2000	Exploitation	0.65	Macedonia
Mamez	Adi	Kukes	689, 06.01.2003	Exploitation	1.132	Albania
Trrull Suroj	Adi	Kukes	690, 06.01.2003	Exploitation	0.945	Albania
Katjel	Prodhime Karbonike	Librazhd	711, 10.07.2003	Exploitation	0.0154	Albania
Kapshtice	Alfa Nikel, sh.p.k	Devolli	845, 07.03.2005	Exploitation	0.497	Albania
Gur i Kuq	Albanian Resources	Pogradec	859, 16.05.2005	Exploitation	1.188	Macedonia
Skroske	Gerold	Librazhd	909, 01.09.2005	Exploitation	0.17	Albania
Debrove	Joal – 06	Pogradec	980,04.12.2006	Exploitation	0.53	Albania
Damba Hudenisht	Dollar Oil	Pogradec	981, 12.12.2006	Exploitation	0.099	Albania
Shkoze	Aren 2003	Pogradec	984, 08.01.2007	Exploitation	0.55825	Albania
Xhumage-Liqeni Kuq	K 12	Librazhd	1021, 13.06.2007	Exploitation	0.5195	Albania
Cervenake Perendimor	K 12	Pogradec	1022, 10.06.2007	Exploitation	0.1748	Albania
Bitincke	Prodhime Karbonike	Devolli	1043, 20.07.2007	Exploitation	0.42	Albania
Elbasan	Prodhime Karbonike	Kukes	978, 04.12.2006	Exploitation		Albania
Ver. Lindor	Adriatic Nickel	Devolli	1075, 28.09.2007	Exploitation	0.2	Albania
Nome	Albanian Resources	Kukes	1089, 19.11.2007	Exploitation		Macedonia
Cervenaka Juglindore	Joal – 06	Pogradec	1114, 12.12.2007	Exploitation	0.53	Albania
Gur Shpati	Ballkan Resources	Librazhd	1186, 16.05.2008	Exploration		Canada
Hudenisht	Alb – Xhoi	Pogradec	1212, 07.07.2008	Exploitation		Albania
Skroske	Gerold	Librazhd	1238, 06.09.2008	Exploitation		Albania
Cervenaka Juglindore	Rej	Pogradec	1242, 24.09.2008	Exploitation		Albania
Kraste-Koxheraj	Albsoni	Bulquze	1259, 16.10.2008	Exploration		Albania
Guri Pergjegjur	Sofimex	Pogradec	1272, 30.10.2008	Exploitation		Albania
Zemblak	Ballkan Resources	Koece	1273, 11.11.2008	Exploration		Canada
Prrenjas	Kurum International	Librazhd	1307, 28.01.2009	Exploitation		Turkey
Berzeshte	Yzo	Librazhd	1338, 27.04.2009	Exploitation		Albania
Cervenaka Lindore	Joni 2008	Pogradec	1357, 04.06.2009	Exploitation		Albania
Mychas	Salica	Has	1364, 10.06.2009	Exploitation		Albania
Vernik – Kokog	Devolli Resources	Devolli	1366, 10.06.2008	Exploration		UK
Arren	Aren 2003	Kukes	1380, 08.07.2009	Exploration		Albania
Kodra e Trrullit	Nika BL	Kukes	1382, 21.07.2009	Exploitation		Albania
Pogradec	Iemr Resources	Pogradec	1383, 23.07.2009	Prospecting		China
Barbatesh	Auto Star	Pogradec	1393, 04.08.2009	Exploitation		Albania
Vulcani	Platinium Alb	Librazhd	1399, 20.08.2009	Exploitation		Albania
Mamez	NickelMine	Kukes	1408, 01.09.2009	Exploitation		Albania
Kokogllave	Devolli Resources	Devolli	1436, 13.09.2009	Exploration		UK
Mamez- Trrull - Lure	Elite Mine	Diber	1441, 15.10.2009	Prospection		Albania

(source: AKBN)

2) Mining

As described above, 6 mines started operation in 2005. In 2009, 12 mines produced lateritic nickel ore. Among 10 companies, only A&F Nickel is owned by the Macedonian enterprise. Except for the Skroska and Bitincke mines, all of them are operated by open pit mining. The Kapshitica mine is

currently operated by open pit mining, however it is not clear whether they can continue open pit mining, because the lateritic layer inclines to deeper level to underground.

In 2009, 3 companies produced 43kt of nickel ore in the Devolli cluster and 7 companies produced 51.84kt in the Librazhd-Pogradec cluster (Table 4.4.4). All of run of mine ores are shipped by trucks (20t) to the Feni Industry, Macedonia and the Ferrinikeli smelter, Kosovo. The grade of nickel ore is inferred to be around 1%, so around 0.98kt of nickel metal were produced and shipped to foreign countries. Ore is transported to Kosovo for around 120km and to Macedonia for around 250km by trailer with 20t of lorryload.

Current mining methods in Kukes and Devolli clusters are open pit as shown in Photograph 4.4.1-1. However the mining of the Devolli cluster have to be changed to underground mining because ore body decline at 20-30 degree to underground (Photograph 4.4.1-2 and Photograph 4.4.1-3). Some mines in the Librazhd-Pogradec are operated by underground mining. For example, Skroske mine (Photograph 4.4.1-4) owned by the local company Gerold sh.p.k. is operated by underground mining using room and pillar method, because ore seam is flat and hanging wall is composed with hard and stable limestone. As shown in Table 4.4.4, they are operating mines with only 3 to 11 employees just like a home industry. Ore price is 25-32US$/t of ore at grade of 1.1%<Ni and Fe<38%. Production cost is around 2.95-11 US$/t of ore and transportation cost is 0.06US$/t of 0.08 US$/t ore km.

Table 4.4.4 Nickel ore production by mines in 2008 and 2009

Mine	Company	Mining Method	Employee	Procuction Cost (US$/t	Transportation Cost (US$/t	Selling Price	Country	2008 (tonnes)		2009 (tonnes)		Export to
								Production	Export	Production	Export	
Bitincke	A & F Nickel	Open Pit	5		0.08	26-34	Macedonia	28,439	24,320	0	0	Macedonia
Bitincke	A & F Nickel	Open Pit	5				Macedonia	1,000	0	1,000	0	Macedonia
Kapshtice	Alfa Nikel	Open Pit	4	11	0.08	26-34	Albania	90,000	49,000	35,000	35,000	Macedonia
Bitincke	Prodhime	Open Pit	6	8	0.08	26-34	Albania	7,800		7,000	3,000	Macedonia
Elbasan	Prodhime	Open Pit	3	7	1.08	26-35	Albania	20,000	20,000	20,000	4,000	Kosove
Debrove	Joal – 06	Open Pit	8	6.05	0.08	26-34	Albania	150,000	155,597	0	26,714	Macedonia
Damba Hudenisht	Dollar Oil	Open Pit	3	2.59	0.08	26-34	Albania	68,000	15,435	6,000	0	Kosove
Shkoze	Aren 2003	Open Pit	3	10.2			Albania	5,000	0	2,000	0	
Cervenake Perendimore	K 12	Open Pit	8	7	0.08	26-34	Albania	22,000	12,000	10,000	20,000	Macedonia, Kosove
Cervenaka Juglindore	Joal – 06	Open Pit	8	15.5		26-34	Albania	0	0	2,000	0	
Cervenaka Juglindore	Rej	Open Pit	7	8.46	0.08	26-34	Albania	0	0	5,000	104	Kosovo
Katjel	Prodhime	Open Pit	5	9	0.08	26-34	Albania	4,600	4,600	0	9,174	Macedonia
Skroske	Gerold	Undergroun	11	14.88	1.08	26-35	Albania	36,000	0	1,840	0	
Berzeshte	Yzo	Open Pit					Albania	0	0	5,000	0	
Mamez	Adi	Open Pit			0.08	26-34	Albania	370	370	0	0	Kosove
Trrull Suroj	Adi	Open Pit			1.08	26-35	Albania	8,481	8,481	0	0	Kosove
Total								441,690	289,803	94,840	97,992	

(source: AKBN)

1. Trull Srroj Mine、Kukes Cluster

2. Bitincke Mine、Devolli cluster

3. Bitincke Mine、Devolli cluster

4. Skroske Mine、Librazhd-Pogradec cluster

Photograph 4.4.1 Pictures of major nickel mines

4.4.4 Nickel Mining in the Neighboring Countries

As shown in Figure 4.4.3 and Figure 4.4.4, not only lateritic nickel mines but also nickel smelting plants are under operation in the neighboring counties such as Kosovo, Macedonia and Greece.

Larco, Greece state owned company, is now operating three domestic lateritic nickel mines such as Kastoria, Evia and Agoioannis and they are sending raw materials to Larymna smelting plant owned by the same company. The Kastroia mine is located near the national border with Albania and ore is sent to the Larymna smelter by truck (http://www.larco.gr/nickel.php). They also import nickel ore not only from the Caldag mine in Turkey, but also from PT Antam in Indonesia. Ores from various sources are blended. Capacity of the smelter is 25,000t/year of Ni containing ferro-nickel. Production is almost steady for recent 10 years (Figure 4.4.4).

In Macedonia, Feni Industry, owned by BSG Resources of French company, has been operating a smelter in Kavadarci. As shown in Figure 4.4.4, production has increased since 2000, and in 2007 and 2008 around 15kt/a was recorded. The raw materials are supplied from the domestic nickel mine, Rzanova. However domestic supply is not sufficient and they relay on supplies from Librazhd-Pogradec and Devolli clusters if Albania, and PT Antam, Indonesia.

The nickel smelter, Ferronikeli in Kosovo had been operated since former Yugoslavia era, but since 1998 it has been idle because the plant was destroyed by bombing by NATO air force. After independence of Kosovo, in 2005, Alferon, UK purchased it by 43MUS$ in the course of privatization, invested 76MUS$ and restarted operation in February 2007. Capacity of ferro-nickel production is around 11kt/a. In the second half of 2008, production was reduced one half of planned production due to low metal price. The Ferronikeli has also three open pit mines in Kosovo; the Dushkaja mine with

estimated reserves of 6.2 million tons, the Suka mine with 0.8 million tons and the Gllavica mine with 6.8 million tons. It is said that nickel resources in Kosovo is not sufficient. They also import lateritic nickel ore from the Kukes cluster, Albania.

It should be inevitable for Albania nickel industry to consider the smelters in neighboring countries as competitors or raw material shipping countries in order to develop nickel recovery plan.

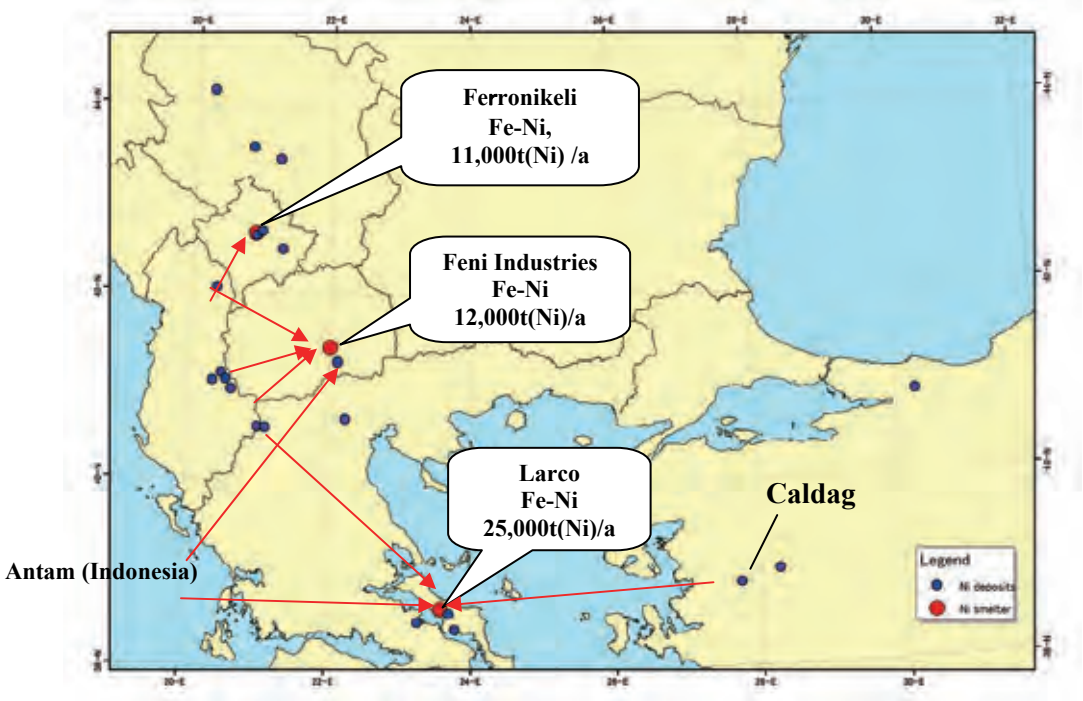
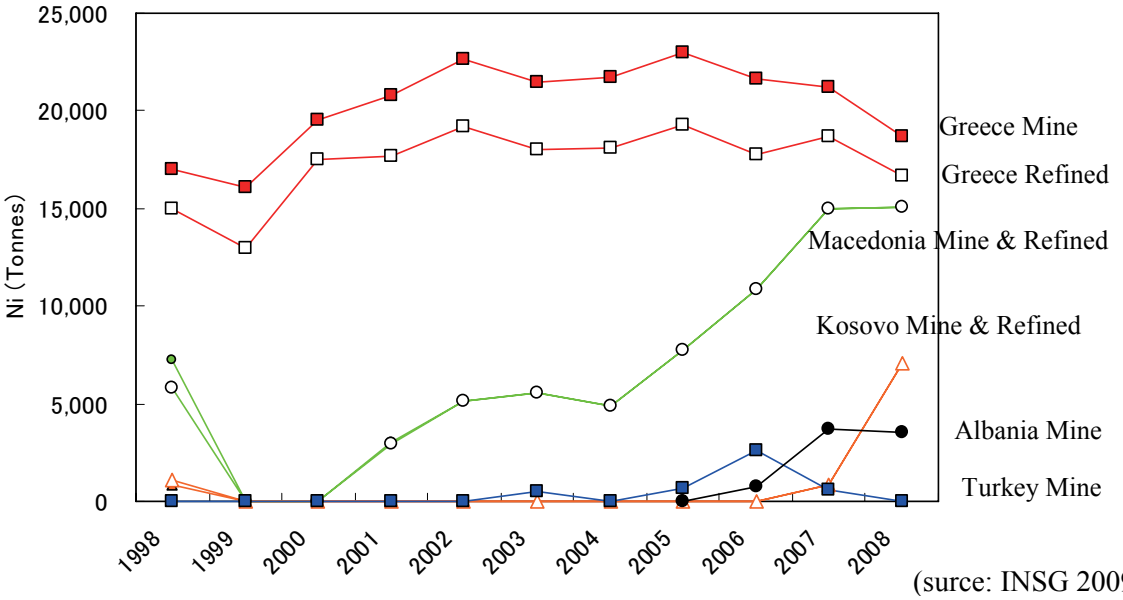


Figure 4.4.3 Nickel mines and smelters around Albania

(red arrow represents ore flow)



(surce: INSG 2009)

Figure 4.4.4 Nickel metal production around Albania

4.4.5 Potentiality of Lateritic Nickel Deposit

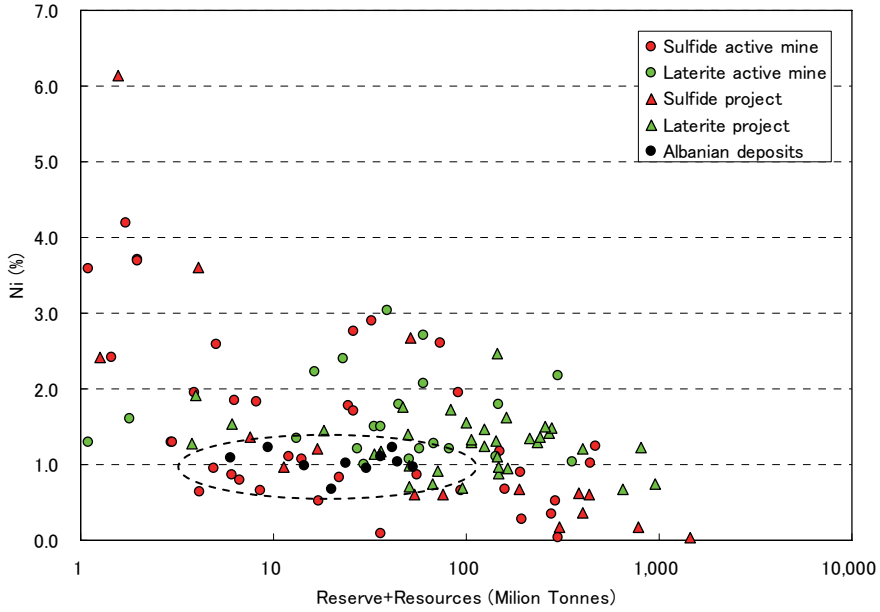
Nickel deposits in Albania are fossilized lateritic nickel deposits formed during the Cretaceous and Paleogene by uplifting of ultrabasic rocks over the surface during the process of convergent plate consisting of oceanic crust and mantle materials by closure of the Neo-Tethys ocean, and then lateritization, like the one observed in present tropical regions such as Southeast Asia and Caribbean islands, occurred to the ultrabasic rocks. After formation of laterite bed on the top of the exposed ultrabasic rocks, they were submerged below water again and overlain by limestone or molasse sediments. The area where ultrabasic rocks directly cropped out on the surface, laterite deposits have already been eroded out, however lateritic nickel deposits remain in place where ultrabasic rocks overlain by limestone (or molasse). Some part of the Librazhd –Pogradec cluster, lateritic nickel beds consisting of Fe-Ni ore occur within conglomerate. They are similar to CID (channel iron deposits) in Australia and thought to be reworked and re-deposited in the paleo-channels. There is possibility of discovery of re-sedimented laterite deposits by analysis of paleo-topography.

The Kukes cluster, with three nickel mines of the Trull-Suroj, Mamaza and Nome, has nickel-silicate reserves of around 80 million tons at grade of about 1.0%Ni and iron-nickel reserves of around 27 million tons.

Major mines of the Librazhd –Pogradec cluster are the Prenjas, Gur i Kuq, Bushtrica and Skoroska mines. They are characterized by iron-nickel deposits and 12 million tons of iron-nickel ore have been produced. Geological reserve of this cluster is estimated to be 141 million tons with 0.9% Ni.

In the Devolli (Blisht) cluster, four mines of the Bitincka, Kokogllava, Strana and Kapshtica occur as one continuous bed, covering a surface area of 60km^2. The Bitincka mine was opened in 1982 and operation was once stopped in 1992. During that period 750,000 tons of iron-nickel ores were produced. This cluster has 90 million tons of resources with 1.18% Ni.

In order to clarify the position of the Albanian nickel deposits in the world, the world major nickel deposits and projects are listed in Table 4.4.5. Albanian nickel deposits are as a whole small to middle size and low grade, and plotted in the lowest grade margin of currently operating lateritic nickel mines as showed in Figure 4.4.5. World class new deposits such as Ambatoby (Madagascar), Baro Alto (Brazil), Goro (New Caledonia) and others will be started operation in due time.



mine: reserves, project: resources + reserves, Albanian deposits: resources

Figure 4.4.5 Grade-tonnage diagram of world major nickel mines and projects

Table 4.4.5 World major nickel mines and projects

Major prpjects

Name	Country	Type	Reserve+Resources	Ni%
Ambatovy	Madagascar	Laterite	164	0.96
Barro Alto	Brazil	Laterite	95.4	1.64
Burukutal	Russia	Laterite	20	1.05
Caldag	Turkey	Laterite	33.5	1.14
Ferix	Guatemara	Laterite	104.5	1.39
Gag Island	Indonesia	Laterite	240	1.35
Gladstone	Australia	Laterite	70.9	0.92
Goro Nickel	New Caledonia	Laterite	323	1.57
Halmahera	Indonesia	Laterite	278	1.49
Jump-Up Dam	Australia	Laterite	67.2	0.75
Kalgoorie Nickel	Australia	Laterite	903	0.74
Koniambo(Cupey)	New Caledonia	Laterite	218.5	2.26
Las Camariocas	Cuba	Laterite	107	1.3
Mindro	Phipinnes	Laterite	147	0.88
Nonoc	Phipinnes	Laterite	140	1.1
Onca Puma	Brazil	Laterite	246.6	1.8
Ramu	PNG	Laterite	143.2	1.01
Ravensthorpe	Australia	Laterite	389	0.62
San Felipe	Cuba	Laterite	234	1.3
Schevchenko	Kazakhustain	Laterite	50.6	0.98
Biankoumu/Sipilou	Ivory Coast	Laterite	258.1	1.5
Syerston	Australia	Laterite	96	0.69
Velmelho	Brazil	Laterite	245	0.8
Eagle	USA	Sulfide	4.1	3.6
Honeymoon Well	Australia	Sulfide	189.1	0.68
Kabanga	Tanzania	Sulfide	46	2.7
Minago	Canada	Sulfide	53.7	0.6
Nunavik	Canada	Sulfide	11.3	0.97
Santa Rita	Brazil	Sulfide	76	0.6
Sheba's Ridge	South Africa	Sulfide	775	0.18
Talvivaara	Finland	Sulfide	414	0.26
Turnagain	Canada	Sulfide	302	0.17
Yakabindi	Australia	Sulfide	434	0.6

Major operating mines

Name	Country	Type	Reserve(Mt)	Ni%
PT Aneka Tamban	Indonesia	Laterite	20.2	2.4
PT Inco Soroako	Indonesia	Laterite	177	1.8
Doniambo. SLN	New Caledonia	Laterite	60	2.7
Cerro Matoso	Colombia	Laterite	77	1.68
Punta Gorda	Cuba	Laterite	75.5	1.2
Group Pentacost	New Caledonia	Laterite		
Moa Bay Nickel	Cuba	Laterite	21.3	1.2
Falcondo	Dominica	Laterite	52.7	1.21
Murrin Murrin	Australia	Laterite	144	1.09
Larco/Larymna	Greece	Laterite	41.6	0.92
Niquel Tocantins	Brazil	Laterite	62.5	1.35
St. Mini Sre de Sud P	New Caledonia	Laterite		
Coral Bay	Philippines	Laterite	22	1.26
Taimyr Pennisula	Russia	Sulfide	328	1.55
Kola Penninsula	Russia	Sulfide	137	0.7
Inco Manitoba	Canada	Sulfide	24	1.88
Voisey's Bay	Canada	Sulfide	31	2.67
Leinster Nickel	Australia	Sulfide	15.4	1.97
Mt. Keith	Australia	Sulfide	194	0.56
Jinchuan	China	Sulfide	440	1
Raglan	Canada	Sulfide	14.7	2.8
Falconbridge Sudbury	Canada	Sulfide	7	1.1
Phoenix	Botuwana	Sulfide	185	0.25
Longshou	China	Sulfide		
Selebi-Phiwe Nickel	Botuwana	Sulfide	31	0.72
Black Swan Nickel	Australia	Sulfide	6.1	0.865
Long Victor Nickel	Australia	Sulfide	1.7	4.19
Montcalm	Canada	Sulfide	4	1.38
Impala Platinum	South Africa	Sulfide		

4.4.6 World Nickel Supply and Demand

World nickel mine production and consumption of refined have increased at an exponential rate since early 20th century and in 2009 mine production reached to 150Mt/a and consumption to 130Mt/a respectively (Figure 4.4.6 and Figure 4.4.7). Consumption by China since 2000 is tremendous, although due to world economic crisis consumption in 2008 was decreased. Current nickel price is quite low because of the accumulated stock pile (Figure 4.4.8) and the slowdown of demand of stainless steel except for China. Some world research companies, however, recently forecast that by the economic recovery, stock pile will be decreased and nickel price will be higher than current level again.

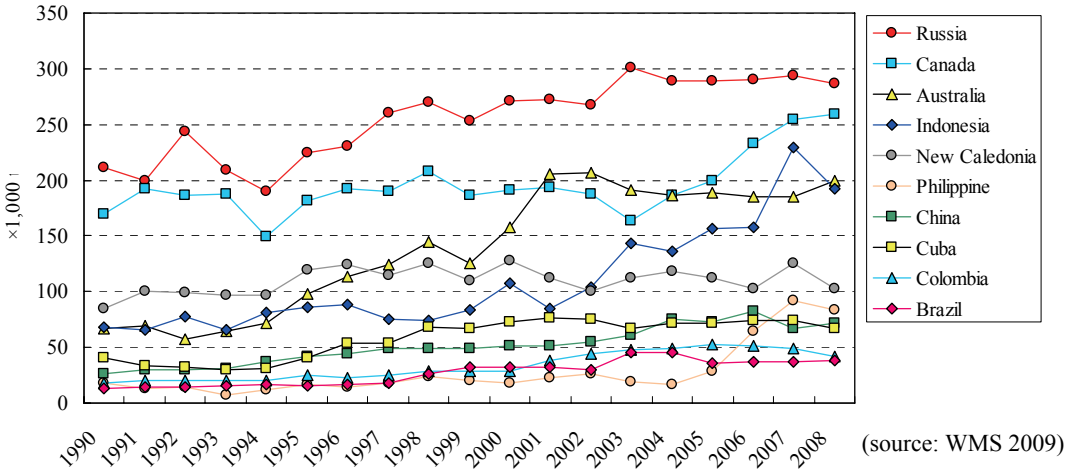


Figure 4.4.6 World nickel mine production

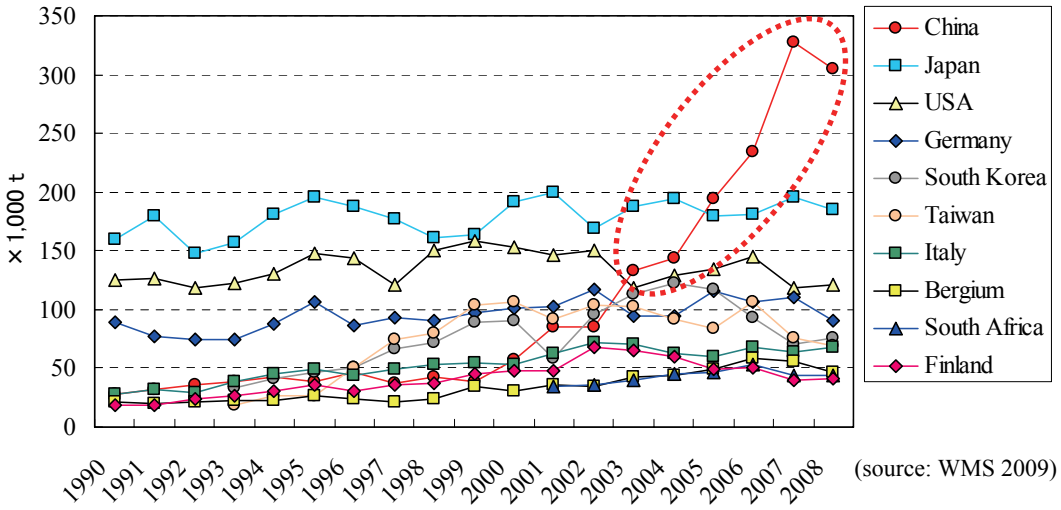


Figure 4.4.7 World nickel consumption

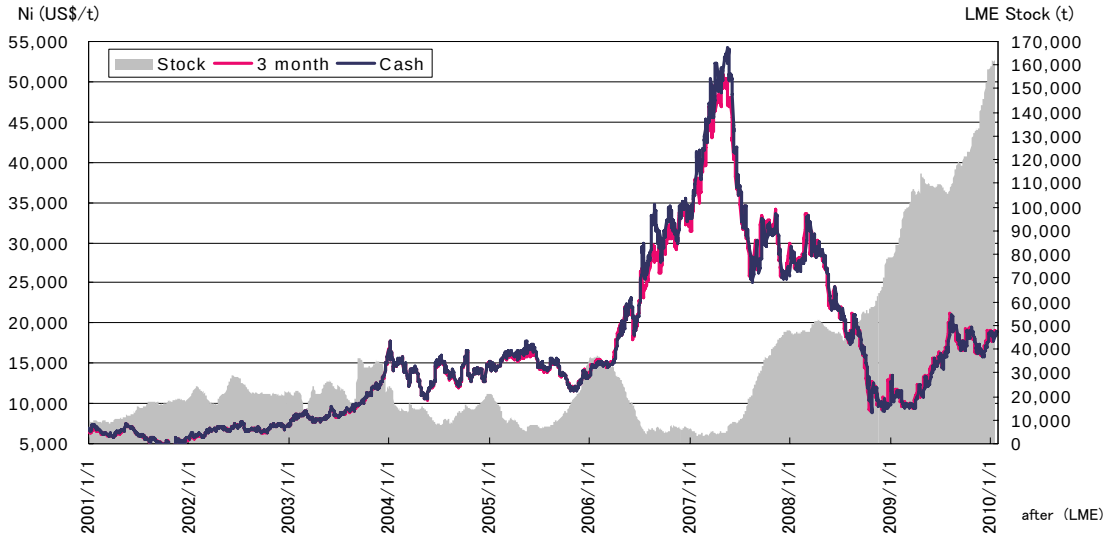


Figure 4.4.8 Nickel LME price and stock

4.4.7 Nickel Production Process

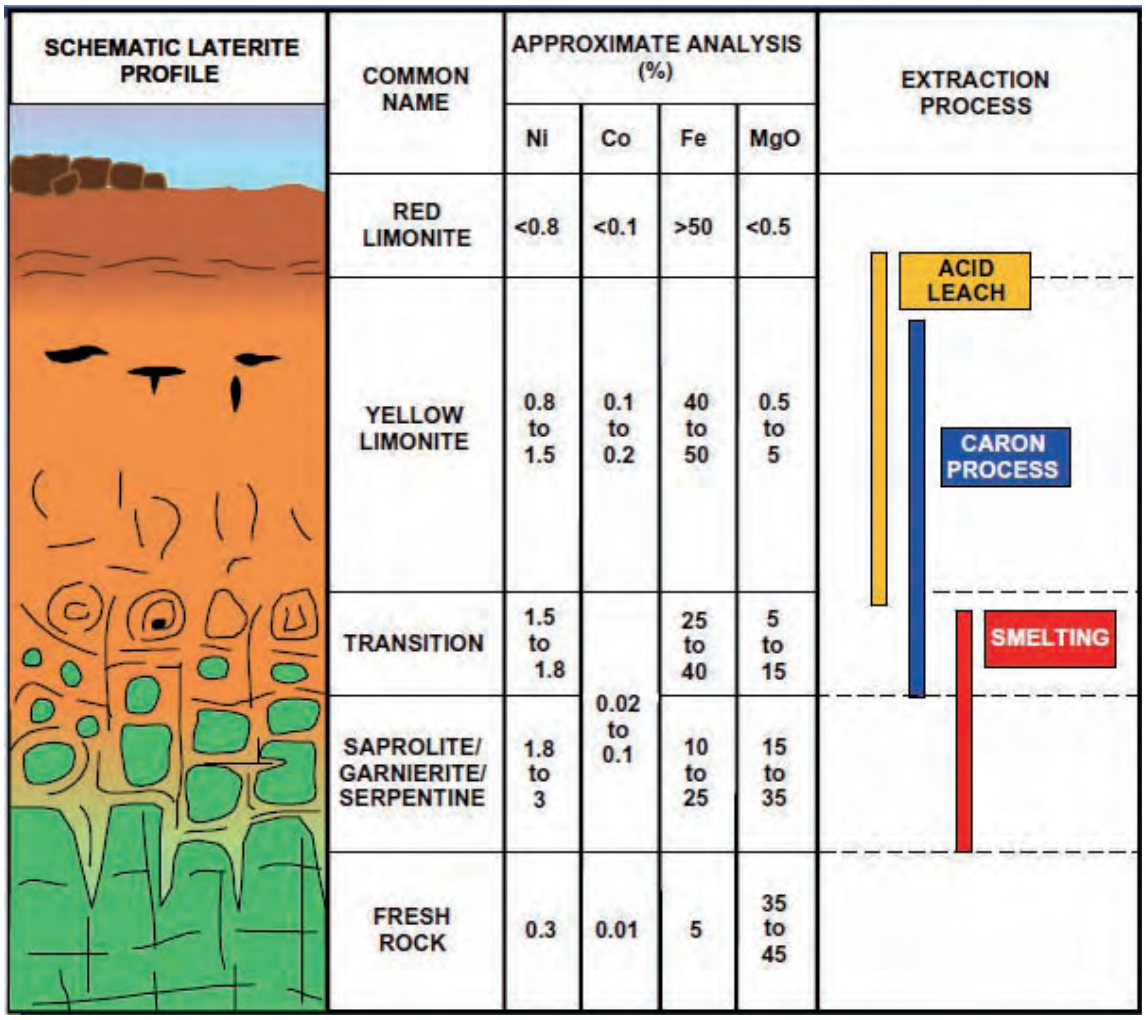
There are few kinds of nickel production process depending on the characteristics of raw materials as shown in Figure 4.4.9. Generally limonitic lateritic nickel is suitable for leaching (hydrometallurgy), smelting (pyrometallurgy) is for saprolite-garnierite dominant nickel laterite. The CARON process (hydrometallurgy) is suitable for intermediate laterites between them.

There are two kinds of process in pyrometallurgical smelting. One process is that ore and coal are mixed and sent into rotary kiln to reduce ore under 900-1000℃, then transferred to electric furnace. All the nickel and 60-70% of iron are reduced to give a ferro-nickel which contains about 25%Ni. The other method is that sulfur or pyrite is added to the kiln. Then furnace matte is produced which contains 30-35%Ni, 50-60%Fe and 9-12%S, and iron is removed by air blowing in converters.

The CARON process was applied commercially during World War II in Cuba. Lateritic ores are roasted in hearth roaster to reduce. Then reduced ore is leached with ammonium carbide. Cobalt is removed from PLS by treatment with hydrogen sulfide. The remaining PLS undergoes ammonium stripping, thickening, reduction with hydrogen and finally sintering with nitrogen to produce a nickel oxide. Energy cost is high, but recovery is relatively low.

Hydrometallurgical process has been developed for treatment of limonitic laterite ore in the countries such as Cuba and Australia. APL is the main method of leaching process and is used in Moa Bay, Cuba, where low Mg ore occurs. The ore is leached with sulphuric acid in an autoclave with high-pressure steam. PLS contains nickel and cobalt dissolution. After the treatments, the solution is thickened to leave nickel and cobalt sulfide matte of 50%Ni. HPAL (high pressure acid leach) process is alternatives of APL and many company tried to apply it but no success. Only the Sumitomo Metal Mining Co. Ltd has been operating smoothly at Coral Bay project in the Philippines.

The heap leaching of low grade limonitic lateritic ore with sulphuric acid is expected to be the low cost operation. For the Murrin Murrin project, Australia has applied this method. Research work on the heap leaching has been carried out in Greece by using low grade lateritic nickel ore funded by the European commission. One heap leaching plant is under construction at the Cladag project in Turkey owned by the European Nickel which will produce 20kt of Ni and 1kt of Co per annum (http://www.enickel.co.uk/). If this project goes well, application of this process to the Albanian lateritic nickel will be expected.



(http://www.insg.org/presents/Mr_Widmer_Oct09.pdf)

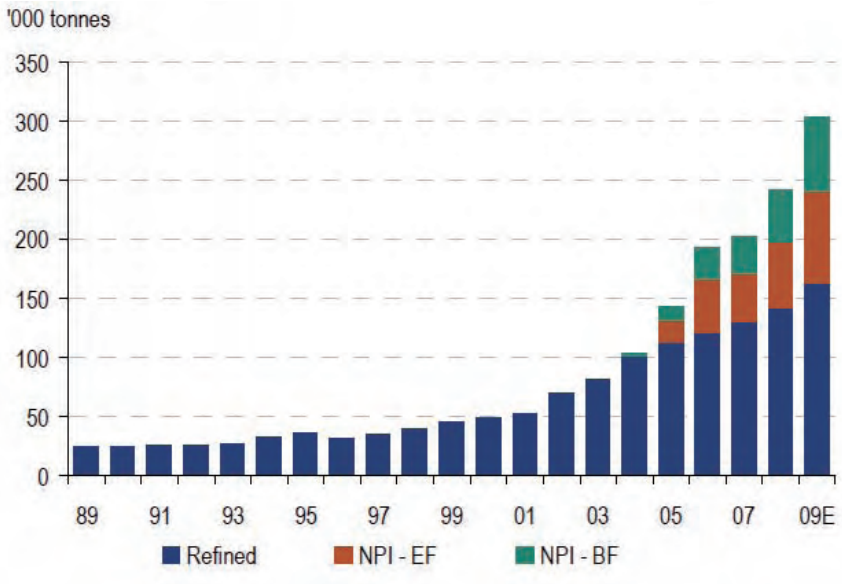
Figure 4.4.9 Lateritic nickel profile and nickel recovery process

4.4.8 Nickel Pig Iron in China Nickel Industry as a New Usage of Low Grade Lateritic Nickel Ores

China is the world largest producer and consumer of stainless steel. In 2007, China produced 26% of the global production of stainless steel and that figure is expected to grow over the next few years. In 2006, nickel prices started to surge because of China's huge demand and China's nickel supply was affected. An opportunity surfaced when Chinese stainless steel producers realized that they needed an alternative supply of nickel. So as to compensate the shortage of refined nickel, China has started production of pig nickel iron for making stainless steel since 2004 and the production also has jumped up until 2009 (Figure 4.4.10). Nickel pig iron is made from low grade lateritic nickel ores, especially limonitic lateritic nickel ores. Currently China imports low grade lateritic nickel ores from Indonesia and the Philippines and processes them in mini-blast furnaces and electric arc furnaces. China is going to start production of nickel pig iron in overseas countries. After a series of sintering and smelting processes, removing impurities such as phosphorus, sulfur and silicon to the specification, the lateritic nickel ores can be processed into nickel pig iron that contains between 4%-13% nickel with iron and other metals account for the balance. Chinese stainless steel producers use nickel pig iron, to which they will add chromium and other materials, to produce 200 and 300 series[*1] stainless steel,

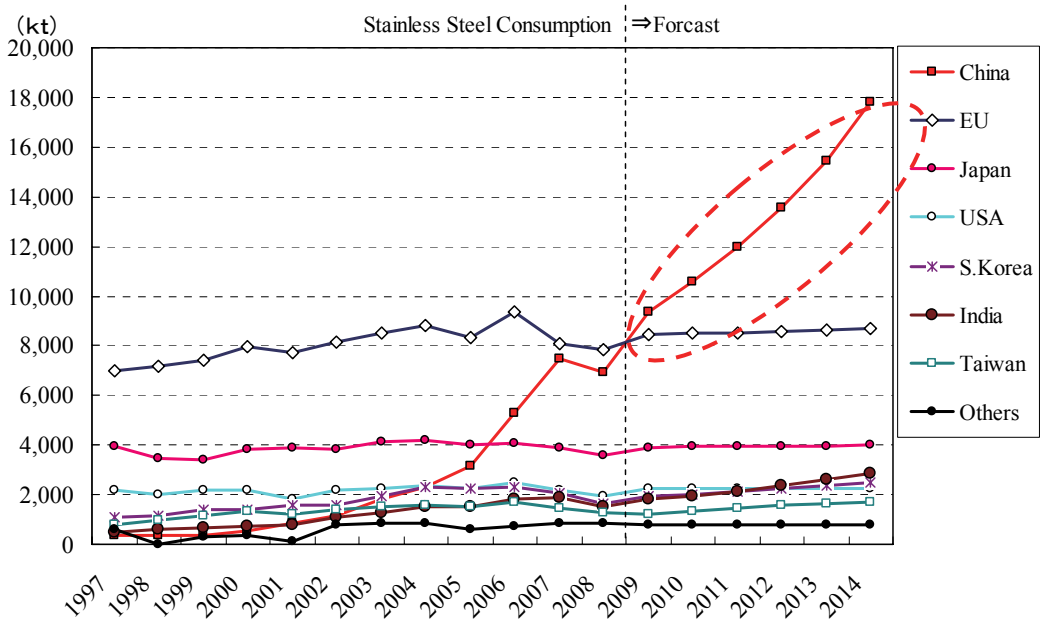
[*1] 200 series has characteristics of corrosion resistance and is composed of 1-5.5%Ni, 16.5-19%Cr and 5.5-15.5%Mn. 300 series has characteristics of workability and is composed of 2.5-37%Ni, 16-26%Cr and 2%Mn.

which accounts for more than 70% of total stainless steel production in China. Chinese domestic growth of demand for nickel and nickel pig iron far exceeds the increase in production of nickel in China over the next few years. Production in 2010 will be estimated over 100,000t (contained Ni metal) of nickel pig iron. Kamiki (2009) forecasted stainless steel production in China as shown in Figure 4.4.11.



(Bank of America and Merrill Lynch, 2009, http://www.insg.org/presents/Mr_Widmer_Oct09.pdf)

Figure 4.4.10 Chinese nickel demand and production of nickel pig iron



(Kamiki, 2009)

Figure 4.4.11 World stainless steel demand

4.4.9 Issues to be considered in Nickel Mining

In spite of having own nickel resources, Albania is currently exporting lateritic nickel ores produced by small mining companies to the smelters in Macedonia and Kosovo without using it in own country. They produce neither nickel metal nor interim nickel products in Albania. In this section, the issues

that should be considered for nickel mining in Albania are made clear and in the next section strategies for nickel mining including direction and methodology are given in order to develop this sector.

1) Exploration –to secure higher grade lateritic nickel ore

The lateritic nickel deposits of Albania are fossilized ones which occur as stratified beds being covered by sedimentary rocks and consequently exploration work is slightly difficult compared with that of present tropical regions. Outline of the distribution of the deposits has been identified already. Next target of exploration should be to find the area with higher grade ore. The Balkan Resources discovered plural lateritic nickel layers within the sedimentary rock, which are thought to be a reworked and re-deposited deposits like a channel iron deposits in the Pilbara region, Australia, so analysis of paleo-topography is recommended. It is regrettable that no systematic chemical analysis of obstacle substances such as phosphorous was not included in the previous survey results.

2) Mining —to reduce excavation cost

Except for the Kukes cluster, full-scale operation will be underground and as a consequence mining cost becomes higher to 15-20US$/t ore compared with open pit mining cost of 3-10US$/t ore. As nickel grade is low, reducing mining cost is one of the most important issues.

3) Nickel processing — finding the most appropriate methods

The nickel extraction process from lateritic nickel ores depends on the characteristics of laterite such as iron content, water content, clay mineral and so on. Generally smelting is suitable for scaprorite-garnielite dominant laterits (Ni-Si ore), leaching process is for limonitic laterite ore (Fe-Ni ore) and the CARON process is for intermediate laterites between them as shown in Figure 4.4.9.

The one of the reasons why mining development of nickel in Albania has been stagnated so far is the problems of processing. As described previously, productivity of the CARON process applied 1980s by using Fe-Ni ore from Librazhd-Pogradec cluster was very low due to shortage of knowledge and old facilities. In 1995-1996, the Elkem, Norwegian company, carried out smelting pilot plant test by the using Ni-Si ore from Kuke and Devolli clusters and obtained promising results. Unfortunately, nickel metal or interim nickel products have not been recovered in Albania since then. Currently nickel ore is exported to Ferronikeli smelter, Glogovac in Kosovo, around 120km away from Kukes and Feni smelter, Kavadarci in Macedonia, around 250km away from Progradec. Transportation cost is estimated to be around 10US$/t ore to Kosovo and 22 US$/t ore to Macedonia, making up majority of production cost.

Full scale mine operation and extraction of nickel in Albania have not yet developed due to low nickel content and high mining cost. In view of efficient use of domestic natural resources, recovery of nickel in Albania is the key point.

4) The main nickel mining player

Apart from copper mining in Albania, the owners of exploitation licenses are mainly Albanian enterprises except for A&F Nickel, Macedonian mining company. With respect to exploration, mainly foreign companies are taking part, such as Adriatic Nickel (a subsidiary of the European Nickel, UK), Balkan Resources (Canadian junior mining company), Kurum International (Turkey) and Inner Resources (China). It is difficult for domestic enterprise to carry out full-fledged mining development to meet demand of a large processing plant in future. But it is desirable to operate jointly so as to bring up domestic mining enterprises.

4.4.10 Strategies for Development of Nickel Resources

Based on discussion described above, the following strategies for development of nickel resources are proposed.

1) Direction to pursue

Geological resource of lateritic nickel deposits in Albania is estimated to be around 300Mt with 1.01% Ni, and they consist of many small to medium scale deposits, but they are low grade in general. Currently small mining companies are producing nickel ores and exporting to neighboring countries such as Kosovo and Macedonia. In order to efficiently utilize domestic natural resources in future, " recover nickel in Albania, add values to it and export " and "keep stable nickel ore production as raw material supplier to the neighboring countries" are recommended. The former should be given priority over the latter and the latter should complement to the former.

The Albanian lateritic nickel deposits are fossilized deposits and occurrence is well understood. Accordingly, regional geological survey is not thought to be necessary except for Kukes cluster where geological features of the depth have not been clarified in detail. The point is consideration of economical recovery methods of Ni and optimal method should be chosen.

2) Methodology

A. To establish the concept model of optimum nickel recovery in Albania

In order to realize the idea of "recovery of nickel in Albania", study of optimum nickel recovery methods and their approximate economical evaluation must be considered. There are some nickel recovery methods from lateritic nickel deposits such as pyrometallurgy, CARON process, pressure acid leach, heap leaching and so on. Application of these methods is mainly depend on the characteristics of chemical and physical properties of ores. Lateritic nickel ores in Albania have also different characteristics depending on each cluster. In the study, possibility of recovery of nickel is examined by taking consideration of characteristics of ores, cost of recovery and infrastructure for making approximate concept model. It is desirable to implement laboratory test for chemical and physical properties of the representative ores of each cluster. Possibility to produce nickel pig iron from low grade lateritic nickel ore, which method China started in 2005, should be considered. It is desirable that the government itself formulate concept model of recovery of nickel and promote investment for mining by delivering its ideas to foreign investors. The following candidates are considered (Figure 4.4.12).

(a) Produce ferro-nickle by pyrometallurgy method by using ores from the Kukes and the Devolli clusters

The pilot test conducted by Elkem clarified that Ni-Si ores from the Kukes and Devolli clusters were suitable for smelting. This idea follows the result of the pilot test. The new smelter will be constructed in Elbasan or near Durres, assuming using Ni-Si ore from the Kukes and Devolli clusters. Lignite from Tirana and/or Devolli as reductant and Ni-Si ore from the Devolli cluster will be transported by trains (Progozhine–Elbasan–Pogradec line). The ores from the Kukes cluster will be transported by trucks. Regarding location of the plant, ex-Elbasan steel complex is equipped with railway facilities, water and electric supply. However old facilities are so devastated and might be polluted that reuse and construction on the old plants should be avoided. Durres is also connected by railroad from Devolli and is equipped with port facilities. An alternative idea is to build a ferro-nickel plant in Kalimash where construction of new ferrochrome plant is planned.

(b) Produce nickel pig iron by using ores from the Librazhd-Pogradec clusters

This idea is to produce nickel pig iron by using Fe-Ni ores from the Librazhd-Pogradec cluster. An electric furnace plant will be built in the ex-Elbasan steel complex or near Durres. This process needs coke as reductant agent. For transportation of ore and coke, railway of Progozhine–Elbasan–Pogradecline is available. In Elbasan the Albanian Chrome is now producing ferrochrome by electric furnaces which use imported coke and it can be purchased jointly. Turkish steel maker, Kurum Holding is granted mining license of the Prrenjas nickel deposits and is considering production of nickel pig iron in Elbasan.

(c) Produce nickel metal by heap leaching using ores from the Devolli and/or the Librazhd-Pogradec clusters

The heap leaching is a challengeable method to produce nickel metals by using Fe-Ni ores of the Devolli and Librazhd-Pogradec clusters. Although processing near the mine site can reduce transportation cost, it is particularly important environmental problem for taking measures for leakage of sulphuric acid which spread from the heap leach pads. The Murrin Murrin project in Australia is currently operated by this process and new operation will start in the Caldag project in Turkey which is example of the first case in the area other than Australia. This method is attractive because it is applicable to low grade lateritic nickel deposits with lower cost.

Full scale mining operation will be mostly underground except for Kukes cluster. For the Kukes region, however, stripping ratio of will become higher. Consequently mining cost of the Albanian lateritic nickel ores definitively become higher. Cost reduction of smelting is inevitable for feasible operation. The average mining cost of 3 nines in Greece owned by Larco is reached to around 30US$/t ore. This figure is three to four times higher than that of world laterite nickel mines. It goes without saying that lower cost recovery method of nickel should be selected in Albania.

In case of selecting method other than heap leaching, it is necessary to transport ore from mine site to the plant. For the case of heap leaching, it is necessary to transport sulphuric acid to mine site. To use national railways, which is cheaper than any other transportation in Albania, for transportation of raw materials with lower cost, it is urged to reform and modernize old railway facilities in cooperation with the project of “CORRIDO VIII” and/or “Albanian Railway Network; improvement of infrastructure and signaling”.

B. Keep stable nickel ore production as raw material supplier to the neighboring countries

In each cluster, domestic and Macedonian mining companies have been producing lateritic nickel ores in small scale and they are shipped to Kosovo and Macedonia by trailer. However both smelters will have shortage of nickel ores for future. In 2009, 98kt of nickel ore, which is equivalent to 980t of nickel metal and value of 2MUS$, was exported to those countries. If recovery of nickel in Albania will be shown to be difficult by the study above, small mining companies could continue to exist as a supplier of ore to smelters of neighboring countries. For local mining companies, operation of nickel mine is not so difficult because of lack of sulfide minerals which causes environmental problems. However shipping cost is so high that operation is hard, while nickel price is staying low. It is desirable that the government would make advice to mining companies to make long term contract with smelters and to adjust production volume of each mining company to sustain stable operation for long term.

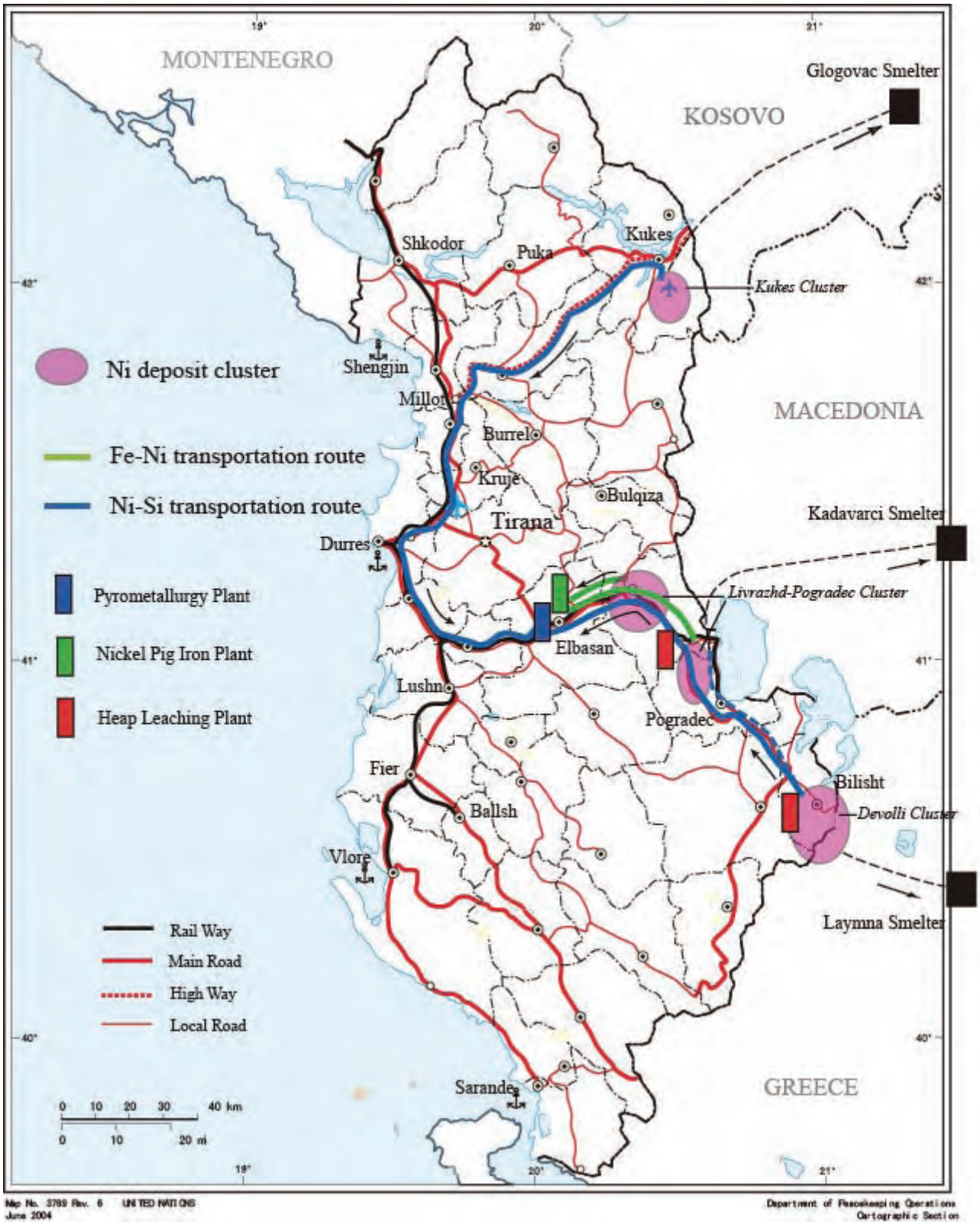


Figure 4.4.12 Ideas of nickel process in Albania

4.5 Non-metallic Resources

4.5.1 General

Albania has favorable geological nature of natural resources and is endued by rich non-metallic resources such as limestone, dolomite, clay, bituminous resources, basalt and various decorative stones of ophiolite sequence rocks (Table 4.5.1).

Table 4.5.1 Non-metallic resources of Albania

	Type of Resources	Geological Resources		Region and Deposit
		Resource (million ton)	Quality	
1	Limestone-Dolomite	655	Limestone CaO 50-55% Dolomite CaO 30-34% MgO 18-21%	Kukes, Tropoje, Peshkopi, Shkoder, Puke, Mirdite, Lezhe, Burrel, Kurbin, Kruje, Tirane, Elbasan, Berat, Korce, Vlore, Permet, Kolonje, Gjirokater, Sarande.
2	Carbonatic Decorative Stones	700	CaO 50%	Sarande, Vlore, Lushnje, Peshkopi, Kukes, Tropoje, Burrel, Kurbin, Kruje, Tirane, Berat, Pogradec, Korce, Gjirokaster.
3	Phosphorites	57	P_2O_5 10-15%	Tepelene (Gusmar), Gjirokaster (Fushe bardhe), Sarande.
4	Clay	262		Prrenjas, Alarup, Tamare, Diber, Zonat bregdetare, Gropat e brendeshme.
5	Silica Sand and Quarzite	200	SiO_2 80% Al_2O_3 10% Fe_2O_3 15%	Pellgu i Tiranes, i Devollit, Kukes (Kallabak), Tropoje (Kernaje).
6	Gypsum Anhydrites	85	$CaSO_42H_2O$ 88-98%	Peshkopi (Perroi i Llixhave, Vrenjt, Perroi i Games, Radomire), Kavaje (Mengaj, Tilje), Sarande (Dhrovjan).
7	Rock Salt	300	NaCl 76-82%	Kavaje (Mengaj, Tilje), Sarande (Dhrovjan).
8	River-bed Aggregates	242		
9	Olivinite	108	MgO 48% SiO_2 37%	Kukes (Kalimash), Tropoje (Kam, Lugu i Zi, Vlad, Kepenek, Cabrat)., Lure, Shebenik, Krrab, Valamare.
10	Volcanic Glass	18		Puke (Qafe Bari, Lumzi).
11	Magnesite	1		Shkoder (Gomsiqe), Levrushk, Korthpule, massif of Bulqiza (Shahinaj, Shengjun, Lucane), Gramsh (Devolli basin).
12	Granite	71		Puke (Levrushk), massifs of Trokuzit, Fierze, Radomire, Peladhi.
13	Ophiolite Decorative Stone	230	SiO_2 37-38% MgO 8-47%	Kukes, Puke, Mirdite, Mat, Librazhd, Tropoje, Elbasan, Bulqize.
14	Basalt	1,064	SiO_2 47% $Al_2O_3$13%	Kukes, Puke, Mirdite, Librazhd, Korce, Kolonje.
15	Coal	794	2,000-5,600kcal/kg	Tirana, Korce-Pogradec, Memaliaj
16	Peats	156	2,200kcal/kg	Maliq
17	Natural Bitumen	0.52		Selenica
18	Bituminous Coal	3	3,500-7,500kcal/kg	Selenica
19	Bituminous Sand	246		Patos, Treblove-Selenice, Selishte, Kucove, Murriz, Kreshpan, Belishove, Greshice, Makaresht, Thumane-Milot

(source: AKBN)

The number of licenses of non-metallic resources issued as of March 2010 and a map of their distribution are shown in Table 4.5.2 and Figure 4.5.1. Among 458 licenses of no-metallic resources, limestone is the most active sector, accounting for 264 licenses currently registered. By the license category of METE, limestone group rocks are separated in two types: one is limestone used for industrial material and cement industry and the other is decorative stones including limestone slab and

limestone-marble. Decorative stones include various rocks other than limestone and sandstone such as conglomerate, dolomite, gabbro, granite, dunite, pyroxenite, troctolite, pelitic schist, serpentine. Natural bitumen, bituminous sand and bituminous gravel are included in bitumen. Other categories are basalt, clay, gypsum, kaolinite, bauxite, carbonate and magnesite. Among the licenses of non-metallic resources, 90% of them are exploitation license and the rest of them are exploration and prospecting-exploration licenses.

Table 4.5.2 Licenses of non-metallic resources

	Exploitation	Exploration	Prospecting-Exploration	Total of License	No. of Employee
Basalt	**10**		**1**	**11**	**16**
Bauxite	**1**			**1**	**0**
Bitumen	**8**	**2**		**10**	**98**
Carbonate	**1**			**1**	**4**
Clay	**29**		**3**	**32**	**440**
Coal	**4**	**3**		**7**	**4**
Decorative stome	**19**		**5**	**24**	**53**
Dolomite			**1**	**1**	**0**
Filling material	**1**			**1**	**0**
Gravel	**6**			**6**	**9**
Gypsum	**11**		**3**	**14**	**35**
Kaolinite	**1**			**1**	**7**
Limestone	**254**		**10**	**264**	**780**
Limestone slab	**27**			**27**	**54**
Limestone-Marble	**14**		**2**	**16**	**54**
Magnesite		**1**		**1**	**0**
Quartz	**7**			**7**	**12**
Sandstone	**16**			**16**	**25**
Sandstone slab	**14**		**4**	**18**	**33**
Total	**423**	**6**	**29**	**458**	**1624**

（source: METE, as of March, 2010）

As shown in distribution map, limestone license are found in all over Albanian where limestone occurs and they are concentrated in the area of Kruja-Tirana. Clay license areas are located mostly near the cost area where Quaternary sediments are distributed and bitumen license are located only in Vlore-Fier area, while gypsum licenses are found in Kavaja area.

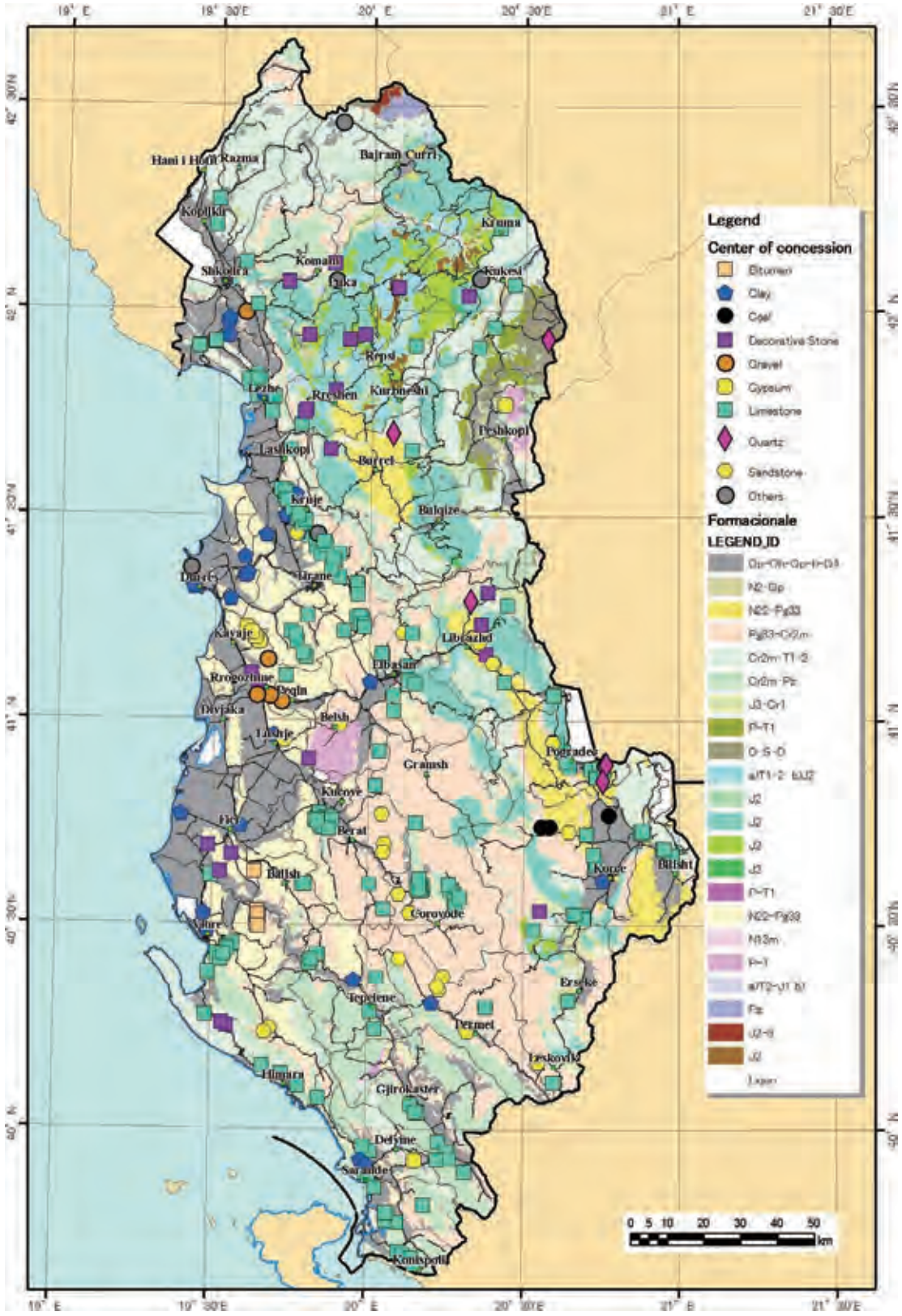


Figure 4.5.1 Distribution of non-metallic resources licenses

Production, investment and number of employee of non-metallic resources sector in the year of 2009 are given in Table1 4.5.3. Because of the cement plants recently started production by foreign (Greece and Italy) investment and increase of road improvement project, limestone is the most active sector in non-metallic resources. In 2009, a total of nearly 6 million m^3 of limestone was produced, and

investment and number of employee are highest in limestone sector among the non-metallic resources, respectively, 1,175 million leke and 780 employees. Since clay is used for production of cement, activity of clay, with annual production of 1.3 million m^3, is partly related to cement production. Quite a large number of people, totaling of 219 employees, are engaged in sector of decorative stones under categories of decorative stone, decorative limestone and sandstone, and investment of this sector reached to 500 million leke in 2009.

Table 4.5.3 Production, investment and number of employee of non-metallic resources

	Production in 2009	Unit	Investment in 2009 (Leke)	Geological Resource	Number of Exploitation License	Number of Employee
Basalt	513,657	m^3	84,564,195	34,037,311	10	16
Bauxite	0	ton	0	0	1	0
Bitumen	13,186	ton	108,180,465	17,900,464	8	98
Carbonate	2,000	ton	200,000	0	1	4
Clay	1,309,979	m^3	94,429,000	22,776,091	29	440
Coal	2,000	ton	680,000	0	4	4
Decorative stome	217,662	m^3	419,659,570	953,940	19	53
Dolomite	0	m^3	0	0	0	0
Filling material	0	m^3	0	0	1	0
Gravel	307,900	m^3	7,100,000	816,403	6	9
Gypsum	80,876	m^3	36,790,000	6,101,067	11	35
Kaolinite	2,000	m^3	650,000	579,581	1	7
Limestone	6,474,044	m^3	1,175,701,834	449,309,444	254	780
Limestone slab	19,603	m^3	11,545,000	3,757,524	27	54
Limestone_Marble	6,253	m^3	44,218,071	191,974,261	14	54
Magnesite	0	ton	0	0	0	0
Quartz	3,150	m^3	12,880,000	41,182	7	12
Sandstone	39,484	m^3	13,977,500	7,882,870	16	25
Sandstone slab	5,148	m^3	36,584,986	514,760	14	33
Total	-	-	2,047,160,621	-	423	1,624

(source: METE)

4.5.2 Natural Bitumen and Bituminous Substances

In Albania, there are many occurrences of natural bitumen and bituminous substances, which were formed by natural transformation in petroleum-bearing area, particularly close to large tectonic faults, commonly occurring between limestone and bituminous dolomite as well as in schist and sandstone. In addition to natural bitumen, bituminous substances such as bituminous coal and bituminous sands occur.

1) Situation of resource

a. Natural bitumen

High quality natural bitumen occurs in the Selenica deposits of Vlora district. It is rare in the world on account of being hosted in favorable geological situation for exploiting and its high quality (ITNPM and AGS, 2005). It has mass, layer and lenticular form of different size, being formed through the transformation of oil within the molassic deposition of the Pliocene. Porous, plastic and glossy, very good quality types of bitumen with ash being 15 to 17% is produced from the Selenica deposits and its softening point is 105 and 115degreeC. Natural bitumen of the Selenica occurs at depth between 30 and 300m and geological resources of natural bitumen are estimated to be 520,000 tons at the horizon of -63m and -83m.

b. Bitumen coal

Bituminous coal occurs together with natural bitumen in the Selenica deposits and it has a free carbon content of 70-92% and calorific power of 3,500-7,500kcal/kg (or 14.7-31.5MJ/kg), and it release light fraction of up to 30%. The bituminous coal distributed at horizon -63m and horizon -83m of the central shaft has ash content between 38 to 45% with calorific power of 4,200-4,800 kcal/kg, and the reserves amount to around 128,000 tons. Bituminous coal is used as fuel, together with imported coke for metallurgical complex at Elbasan. It consists of oxidized bitumen, clay, alevrolites and small pieces of fragmented stones and it has characteristics as given in Table 4.5.4 (ITNPM and AGS, 2005).

Table 4.5.4 Classification and characteristics of bitumen coal

Description	1st class	2nd class	3rd class
Quantity of heat			
Mj/kg	25.1	20.9	12.5
Kcal/kg, not less than	6,000	5,000	3,000
Ash in %, not more than	26	40	50
Sulfur in %, not more than	8.2	7.0	6
Humidity in %, not more than	16	18	20
C in %, not more than	18	48	37

（source: ITNPM and AGS, 2005）

Geological reserve of bitumen coal is calculated to be 3-4 million tons in the Selenica area and bitumen coal occur accompanied by natural bitumen in the form of layer and lens at depths 30-300m. From the Selenica, around 17 million tons of bituminous coal has been produced.

c Bituminous sand

Because of favorable geological nature of Albania, large reserves of bituminous sands have been discovered in Patos, Treblova-Selenica, Selishta, Kucova, Murriz, Kreshpan, Belishova, Greshica, Makaresht, and Thumana-Milot. In Albania, bituminous sands present the floating asphalt of the oil and gas layers, the same manner of the formation as that of the bituminous sands formed in Venezuela, Alberta (Canada) and etc (ITNPM and AGS, 2005).

Treblova, Kasnica and Visoka are three important bituminous sand deposits in Albania, accounting for 246 million tons of resources (Table 4.5.5). Most of the area in Treblova is licensed, but most of the area in Kasnica and Visoka are free. Bituminous sands were once treated in the plant set up years ago in Patos, processing 2 million tons of minerals, but the plant has never achieved effective economic parameter on account of the poor technology employed.

Table 4.5.5 Geological resource of bituminous sand in Albania

(in million tons)

Mine	Total	Licensed	Free	Note
Treblova	140	84	47	Exploited 2.8 million tons
Kasnica	45	0.54	42	
Visoka	61		51	
Total	246	84.54	150	

（source: ITNPM and AGS, 2005）

2) Exploitation activities

Among 9 exploitation licenses of natural bitumen and bituminous substances registered in 2009, 4 mines are yielding production in 2009. The Selenica mine, operated by French company, produced 8,261 tons of natural bitumen and bituminous coal and investment of 2009 was 108 million leke with

engagement of 78 employees. The asphalt for road pavement is produced from bituminous substance. Operation of other three mines is small scale, producing, respectively, 4,000 tons, 840 tons and 85 tons of mainly bituminous sand in 2009.

Although local and foreign companies have obtained concession, almost none of the licensed entities are involved in production and processing activities of bituminous sand. Recently the number of foreign companies have been interested in exploiting Albania's bituminous sands, however, they have withdrawn for two reasons (ITNPM and AGS, 2005).

- deposits containing the bulk reserves have been licensed.
- not fully convinced to invest because of the quite considerable investments required to be made in applying the extraction technology and processing technology.

Production and cost-effective processing of the bituminous sands would require foreign investors to be involved in undertaking studies of processing, designing extraction and processing units, setting up extraction and processing facilities. Accurate and comprehensive information on the potential of natural bitumen and bituminous substances in Albania will increase the interest for investments in this area which will lead to considerable social benefit.

4.5.3 Clay

1) Clay resources

Clay is raw material used in cement, brick and tile industries. The clay industry, producing brick and tiles, was started in 1930's in Albania. Between 1950 and 1991, 27 locations of production of ceramics and 5 cement factories using clay were established and were running. At present, over 90 clay facilities have been discovered on which nearly 30 depositis are being exploited to be used for production of bricks, tiles, cement, majolica tiles and artistic products.

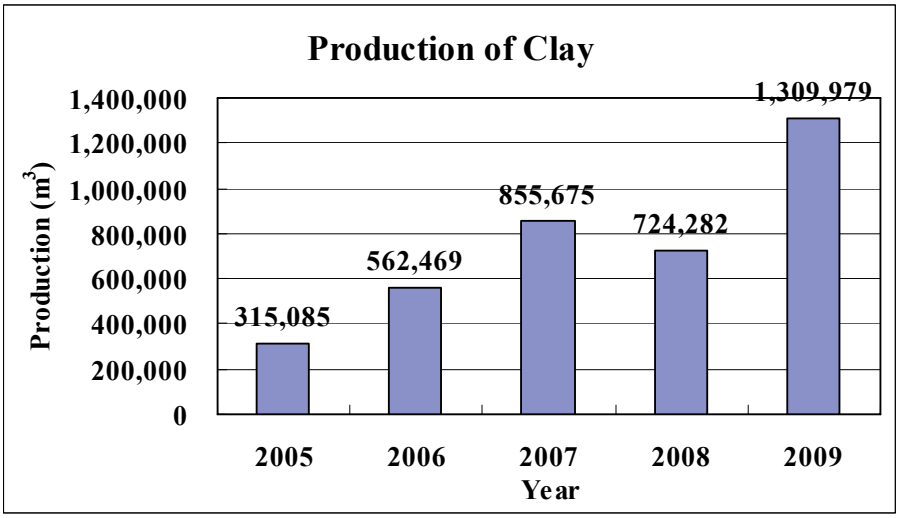
Porcelain clays occur in Tamara and Burrel, while montmorillonite clay is found as attapulgites in Shengjin and Burrel. Clays in flysch formation are most important and they are widespread over 8 locations of Bradashesh (Elbasan), Drishi and Tarabosh in Shkodra, Brar in Tirana and etc. These clays have high CaO content that makes them suitable to be used in cement production.

2) Exploitation activities

Since first license of clay was issued in 2000, number of clay licenses increased gradually and now the number of licenses has reached to 32, consisting of 29 exploitation licenses and 3 prospecting-exploration licenses. The production of clay was higher in Durresi and Lushnje districts, where clay was used mainly to produce bricks. But recently after establishment of 5 to 6 cement factories in Kruja-Kurbin-lezhe area, the production of clay in Kruja district drastically increased for the demand of cement factories. Since 2007, Kruja is the highest clay producing district. In accordance to the increase of demand of clay by cement industry, annual production of clay has increased gradually reaching to 1.3 million m^3 (Figure 4.5.2).

Exploitation of clay is mainly conducted by 2 large companies related to cement industry in Kruja, Antea Cement and F. Kruja cement factory. Sum of clay production by these two companies exceed 80% of total clay production of Albania. Other than these two, exploitation of clay is conducted in a small scale, annual production being less than 50,000 m^3 with engagement of few employees. These small operations are also found in the areas other than Kruja and they are producing raw material for brick and tile.

Towards full operation of large cement factories with increasing demand of clay, production of clay would keep increasing.



(source: AKBN)

Figure 4.5.2 Annual production of clay

4.5.4 Coal

1) Coal resources

Albania used to be a prominent coal producing country in Balkan and it produced 20 million tons of coal per year 20 years ago. Coal reserves of Albania amount to 794 million tons. The coal mines are mainly distributed in three areas and most of them are located in Tirana Area.
:

Tirana area	around 86% of the reserves
Korce-Pogradec Area	10%of the reserves
Memaliaj Area	4% of the reserves

The coals of Albania are mostly lignite coals with the refill analytical calorific power varying from 2,000 to 5,600kcal/kg (average 3,200-3,300kcal/kg). It is necessary to be enriched to 4,500-5,500kcal/kg for using these coals for thermal power plant after exploitation. Turfs are another energy source. In the turf deposits at Maliq, 156 million m^3 turfs of 2,200kcal/kg have been discovered.

2) Exploitation activities

Many coal mines operated in the past are abandoned or they are dormant. Only 7 licenses are currently registered of which 4 are exploitation licenses and 3 are exploration licenses. Only one mine in Korce claims production of 2,000 tons in 2009.

In an attempt of reviving the coal industry of Albania, the government tried to forge reliable and sustainable system from the economic and environmental perspectives. In connection with this, reopening of coal mines such as Memaliai, Pogradec, Tirana, Korca and Mborje-Drenovo and using their coal for thermal power plant were considered for the easing the social burden created through the shut-down of mines and power shortage (ITNPM and AGS, 2005).

There are many negative factors for reviving coal industry. Most of the coal resources are found in Tirana basin close to residential area. Consequently, there are many environmental issues to be solved for mining operation of coal mines. Because the bed rocks of the coal mine is unstable and coal layer is generally thin, no more than 1m, efficient mining operation is difficult in Albania. Further coal of Albania is generally lignite with high sulfur content of 5% and low calorific power of 3,520kcal/kg, preventing direct use of the coal to thermal power plan. Considering the above and economic factors,

if coal is necessary to Albania, importing coal from countries such as Germany, Czech and Poland can be another alternative to be considered.

4.5.5 Decorative Stones

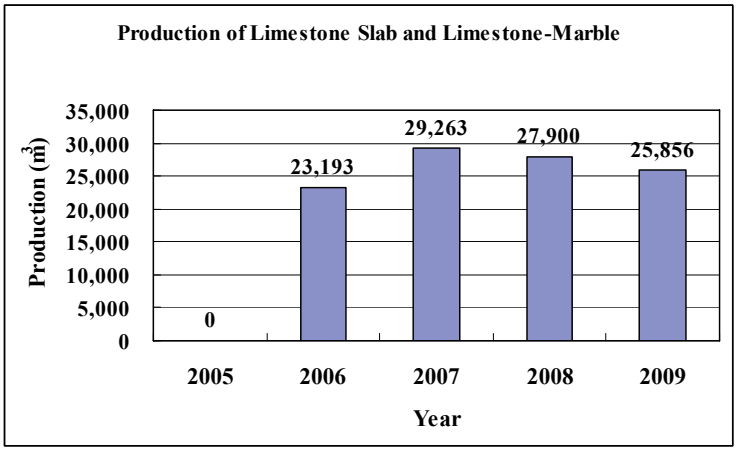
Decorative stones include limestone slab, limestone-marble, sandstone, sandstone slab and other decorative stones (ophiolite rocks). From a few years ago, finding prospective atmosphere in the Albanian decorative stone, the government has been making efforts to promote this sector.

1) Limestone slab and limestone-marble

Limestone slab are used to produce flagstones for building facing or for the pavement. Among 27 exploitation licenses issued as of March 2010, 12 licensed areas had production in 2009, accounting for a total production of 19,603m^3.

Limestone-marble are produced as blocs of different dimensions and they are cut to produce plates and blocks for facing. A total of 14 exploitation licenses are registered as of March 2010 and, among them, 6 license areas had production in 2009, with a total production of 6,253m3. The produced amount is still small but total investment of 6 companies in this category amounts to 44 million leke. Some of licensed companies are investing on new technologies and to bring cutting machines to prepare for increase of demand in future.

Figure 4.5.3 shows annual production of limestone slab and limestone-marble. Although production slightly decreased for recent three years, because of increase in amount of investment, production of decorative limestone is expected to increase in future.

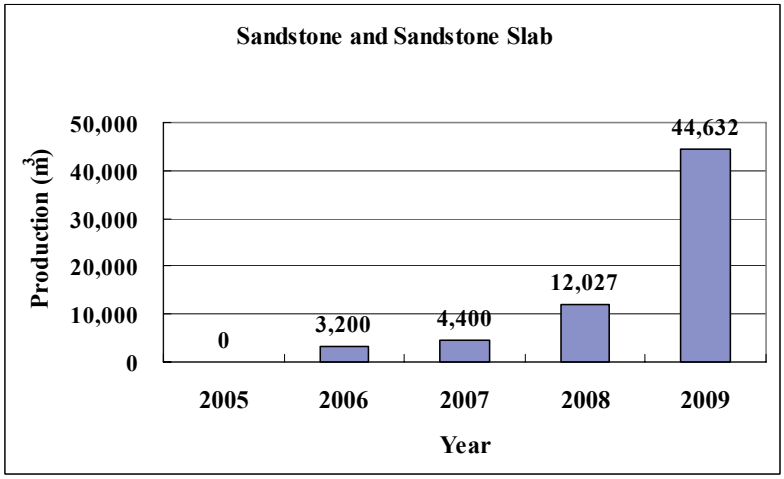


(source: AKBN)

Figure 4.5.3 Production of limestone slab and limestone-marble

2) Sandstone

Sandstone includes categories of sandstone and sandstone slab and they are used to produce brocks and tiles. The number of registered exploitation licenses for sandstone is 30 in addition to 4 exploration-prospecting licenses. As shown in Figure 4.5.4, production of sandstone increased drastically because of increase in domestic and foreign demands. The annual production of 2009 was 44,632 m^3, more than three times higher than production of 2008. A total investment for the sandstone in 2009 was nearly 50 million leke. The siliceous sandstone sector has positive future and many companies are investing on new technology, bringing cutting machines to prepare future increase of demand.



(source AKBN)

Figure 4.5.4 Annual production of sandstone and sandstone slab

3) Other decorative stones

This category includes decorative stones other than limestone and sandstone, and ophiolite rocks, such as gabbro, granite, dunite, pyroxenite, plagioclase granite, serpentine, troctolite, pelitic schist and conglomerate, are included. As of March 2010, 19 exploitation license and 5 prospecting-exploration licenses are registered. The production of 2009 of this category is 217,662m^3 and the rock types produced are plagioclase granite (60%), pelitic schist (30%), conglomerate (9%) and granite (1%). The amount of investment for this category is 400 million leke, mostly invested to granite.

4) Exploitation activities

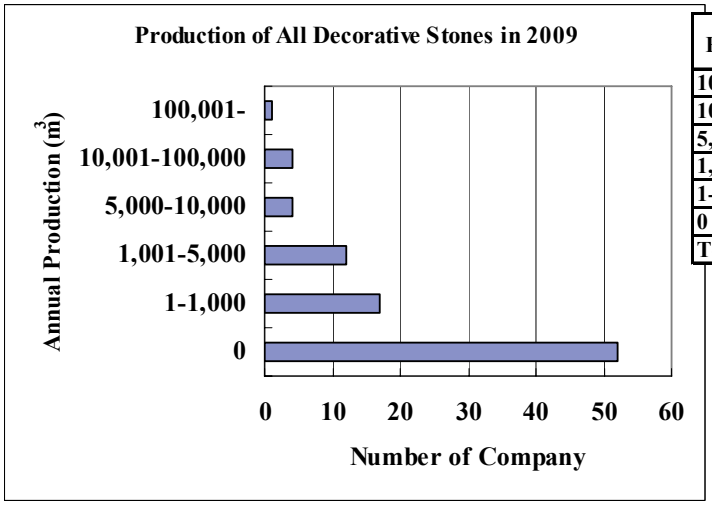
Because of increase of demand and government assistance, production of decorative stones including limestone and sandstone is increasing, reaching total production of 280,000m^3 in 2009. Among them, plagioclase granite shows highest production of 130,000 m^3.

Demand of decorative stones in Albania is high and they are imported from Italy and Greece. But recently, assisted by governmental support by AKBN, Albania started to export sandstone of Berat to Italy. As shown in Figure 4.5.5, export of decorative stones is drastically increasing recently. The amount of export is far less than import now, but in future it is expected that the time will come when export surpasses import.

(source: AKBN)

Figure 4.5.5 Export of stone plate

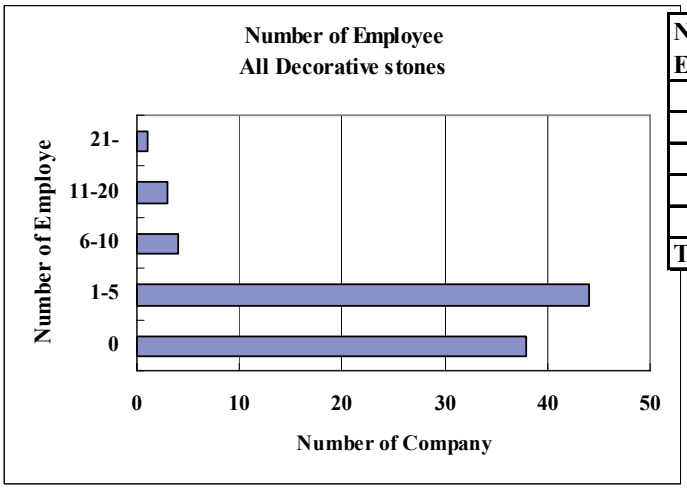
The number of exploitation licenses of all decorative stone is 90. Among them, 52 companies show no production in 2009 and only 9 companies produced decorative stones more than 5,000m^3 (Figure 4.5.6). For number of employees, 38 companies show no employee and 44 companies have 1 to 5 employees (Figure 4.5.6). The companies with more than 5 employees are only 8 companies. Exploitation work of decorative stones is conducted by few relatively large companies with annual production of more than10,000m^3 and other many small companies with few employees. Among the companies with no production in 2009, an intention of exploitation activities in future is observed for some of the companies because of certain amount of investment. But most of companies without production in 2009 show no employee and no investment.



Production (m^3)	Number of Company	%
100,001-	1	1
10,001-100,000	4	4
5,000-10,000	4	4
1,001-5,000	12	13
1-1,000	17	19
0	52	58
Total	90	100

(source: METE)

Figure 4.5.6 Classification of company by annual production: all decorative stones



Number of Employee	Number of Company	%
21-	1	1
11-20	3	3
6-10	4	4
1-5	44	49
0	38	42
Total	90	100

(2009, source: METE)

Figure 4.5.7 Classification of company by number of employee: all decorative stones

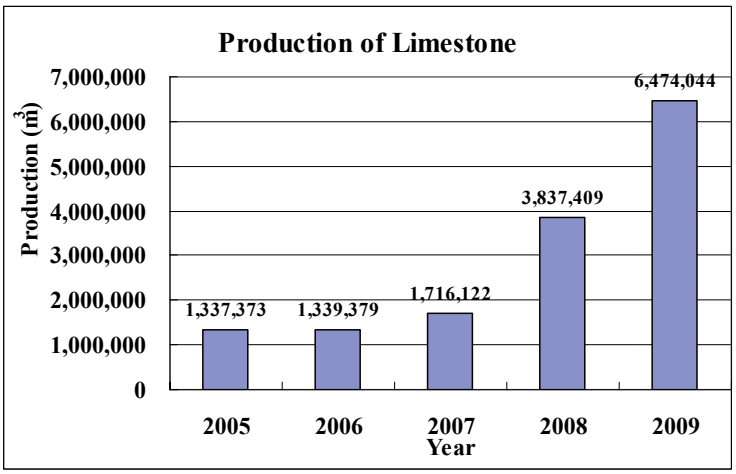
4.5.6 Limestone

1) Limestone resources

Limestone is used for many purposes such as construction materials, raw materials in cement industry, lime production and constriction of road and harbor. Limestone with geological resources of 655 million tons occurs in many places in Albania from the oldest Triassic to Jurassic geological unit to youngest Cretaceous and Eocene geological unit. The main limestone producing districts are Kruja, Tirana, Berat, Elbasan.

2) Exploitation activities

A total of 264 licenses, 254 exploitation licenses and 10 prospecting-exploration licenses, are currently registered as of March 2010 and they are distributed in a whole area of Albania with most densely distributed area of Tirana-Kruja Area. The production of limestone has increased rapidly in recent years reaching nearly 6.47 million m^3 in 2009. (Figure 4.5.8). The main reasons for this are starting of new cement factory in Kruja area and construction of Rreshen-Kukes highway.

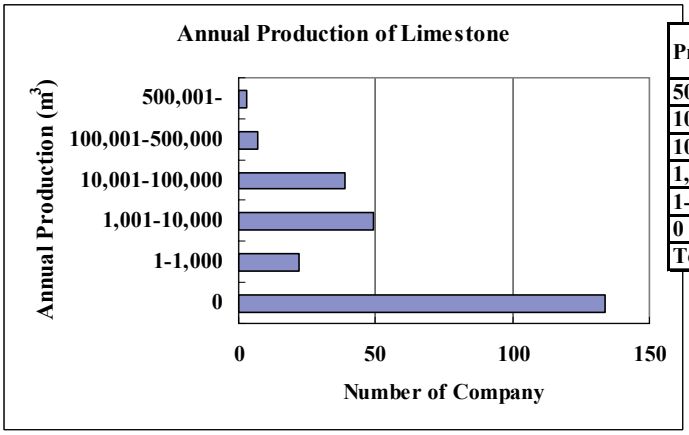


(source: AKBN)

Figure 4.5.8 Annual production of limestone

Two foreign financed companies, Fushe Kruja Cement Factory (Seament Holding, Lebanon) and Antea Cement (Titan cement, Greek), have started operation and they, respectively, produced 0.9 million m^3 and 2 million m^3 of limestone in 2009. If full operation of these factory and others planed to operate start, production of limestone will further increase in future. Cement industry of Albania is considered to be prospective. Not only Kruja area, but Kukes and Shkoder areas are also prospective if expecting export of cement to Kosovo and Montenegro. For construction of recently completed Rreshen-Kukes highway, limestone of 1.3 million m^3 was used. Considering that further development of infrastructure of Albania will be continued, demand of limestone will further increase.

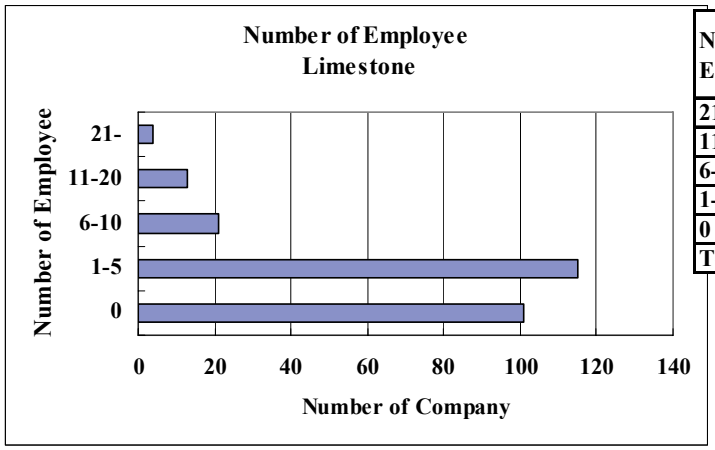
The number of exploitation license of limestone registered as of March 2010 is 254. Among them, companies with annual production of limestone more than 100,000m^3 are 10 companies and they are related to cement industry (Figure 4.5.9). Many companies fall in production range of 1,000m^3 and 100,000m^3 and they are exploiting limestone for construction materials. Among 254 companies, more than half of 134 companies show no production in 2009. For number of employees, 101 companies (40%) show no employee, and companies with 1 to 5 employees and more than 10 employees are, respectively, 115 companies (45%) and 17 companies (7%) (Figure 4.5.10). Among the companies with no production in 2009, an intention of exploitation activities in future is observed for some of the companies because of certain amount of investment. But most of companies without production in 2009 show no employees and no investment.



Production	Number of Company	%
500,001-	3	1
100,000-500,000	7	3
10,001-100,000	39	15
1,001-10,000	49	19
1-1,000	22	9
0	134	53
Total	254	100

(2009, source: METE)

Figure 4.5.9 Classification of company by annual production: limestone



Number of Employee	Number of Production	%
21-	4	2
11-20	13	5
6-10	21	8
1-5	115	45
0	101	40
Total	254	100

(2009, source: METE)

Figure 4.5.10 Classification of company by number of employee: limestone

4.5.7 Basalt

1) Basalt resources

Because of distribution of ophiolite rocks in Albania, huge amount of basalt occurs from Kukes to Korca, and resource of basalt is believed to be 1,064 million tons. The physical property examination conducted for the basalt by AKBN showed that basalt of Albania was the most suitable rock to be used for paving railway and road track and particularly for railway track intended for high speed trains of over 300km/h (ITNPM and AGS, 2005).

2) Exploitation activities

A total of 11 licenses, 10 exploitation licenses and 1 prospecting-exploration license, are registered as of March 2010 and most of the license areas are located in Mirdite area. The total production of basalt in 2009 is 513,657m^3 and most of the production is from one company in Mirdite. The rest of 2 companies have production in 2009 but it is a small amount. The three companies with basalt production made investment in 2009 and they seem to be trying to increase production in future.

The physical examination of Albanian basalt fulfills physical and technical specifications for pavement of road, railway track of normal trains and high speed trains. Further abundant basalt is found close to railway station and major road. Considering these, basalt is prospective industrial materials in future for supplying demand of Albania and neighboring countries.

4.5.8 Gypsum and Albaster

1) Resources

Evaporates including gypsum, anhydrate and rock salt occur in many places of Albania, particularly in Korab and Ionian areas. The occurrences of evaporates related resources are more than 34 locations in Albania and resources is believed to be more than 80 million tons. Gypsum has quite a wide range of use in many industries, such as cement industry, plaster, medicine and decorative stones.

2) Exploitation activities

A total of 14 licenses, 11 exploitation licenses and 3 prospecting-exploration licenses, are registered as of March 2010 under categories of gypsum and gypsum-alabaster. The total production of these in 2009 is 80,876m^3 and these are produced from three companies in Kavaja and one company in Elbasan. In 2008, 11,953 tons of gypsum was exported and production of rock salt is about 25,000 tons/year. The demand of these evaporates to vigorously boost production is not clear at present.

4.5.9 Other Non-metallic Resources

Other nom-metallic sources include bauxite, dolomite, gravel, kaolinite, magnesite and quartz. Although categories of phosphorites and volcanic glass are not found in license list of METE, these resources are found in Albania.

Despite abundant production of bauxite in Montenegro, only one license is registered in Tropoja. Low Al/Si ratio of bauxite in Albania compared with one in Montenegro and occurrence of bauxite in rugged mountain as high as 2,000m make difficult for development of bauxite mine in Tropoja area.

One license is found each for dolomite and kaolinite. Dolomite shows no production and production of kaolinite is 2,000 tons in 2009. Only one exploration license is found for magnesite.

4.5.10 Prospective Non-metallic Resources

Among non-metallic resources, bitumen, materials for cement industries (limestone and clay), decorative stones (sandstone and limestone) and industrial materials (limestone and basalt) are considered to be most prospective for future development in Albania and development of these resources should be further promoted for boosting production for benefit of Albania.

Exploitation of bituminous substance is conducted by French company and more than 100 million leke was invested in 2009. Although enough resources of bituminous substance exist in Albania, investors are reluctant for investing for this sector because considerable investment is necessary for applying extraction technology and processing technology. More accurate understanding of potentiality of bituminous substance is required and the information of these should be open to foreign investors.

The demand of materials related to cement industry such as limestone and clay drastically increased recently by starting operation of foreign financed cement factory. If full operation of these factory and others planed to operate start, production of limestone will further increase in future. Since abundant resources of limestone, clay and gypsum exist in Albania, considering further continuation of improvement of infrastructure in Albania, in addition to export of cement to neighbor countries of Kosovo and Montenegro, cement industry has bright future.

Because of high demands of decorative stone such as sandstone, limestone and ophiolite rocks in Albania, decorative stones are imported. Recently, Albania started export of sandstone to Italy by the government support. Because of abundant high quality resources existed in Albania and high domestic demand of decorative stones, productions of these together with export are expected to

increase in future. Further development of this sector should be driven forward including promotion of foreign investment

Because of further continuation of improvement of infrastructure of Albania and abundant resources existed, demand and production of industrial materials (limestone and basalt) are expected to increase in future. The physical examination of Albanian basalt fulfills physical and technical specifications for pavement of road, railway track of normal trains and high speed trains, and basalt occurs in convenient locations for transportation. Development of basalt with consideration of export should be further driven forward.

Other than above, depending on change of economic situation and investment atmosphere, some of the non-metallic resources can be prospective if more detailed survey is conducted for understanding their resources. They are evaporates (gypsum, anhydrite and rock salt), phosphorite, quartz and silica sand.

4.5.11 Problems existing in Nom-metallic Resources

Having favorable geological nature of various natural resources, Albania is rich in non-metallic resources. Among these, bitumen, materials for cement industries (limestone and clay), decorative stones (sandstone and limestone) and industrial materials (limestone and basalt) are considered to be most prospective for future development in Albania. Making best use of these non-metallic resources by driving forward further development, including promotion of foreign investment, will contribute greatly to economy of Albania. The problems that sector of non-metallic resources are currently facing are given below.

1) Situation and location of exploitation

The number of licenses for non-metallic resources is many, a total of 458 licenses being registered including exploitation and exploration. Categories of limestone and decorative stones, particularly, have many licenses and they are, respectively 254 and 90 licenses. Among the licenses of non-metallic metals, more than half of them (53% of limestone licenses and 58% of decorative stone licenses) show no production in 2009. Exception of few licenses, most of licenses with no production show no investment and no employee. There are many license owners whose intention of future exploitation work is not clear. These dormant exploitation licenses prevent ambitious new comers to start exploitation activities and they hamper development of non-metallic resources.

Many licenses with exploitation activities in quarry are being issued without enough consideration for natural, topographic and environmental aspects and there are some cases of existence of big quarry close to residential area (Figure 4.5.11 and Photo 4.5.1). As a consequence, destruction of natural environment and environmental problems to inhabitants have been caused. In Kruja area, for example, there are many quarries close to residential area. In Ura Vajgurore of Berat, there is relatively large quarry of limestone close to residential area and the residents have been complaining of noises and destruction of houses by exploitation activities such as blasting in the quarry.

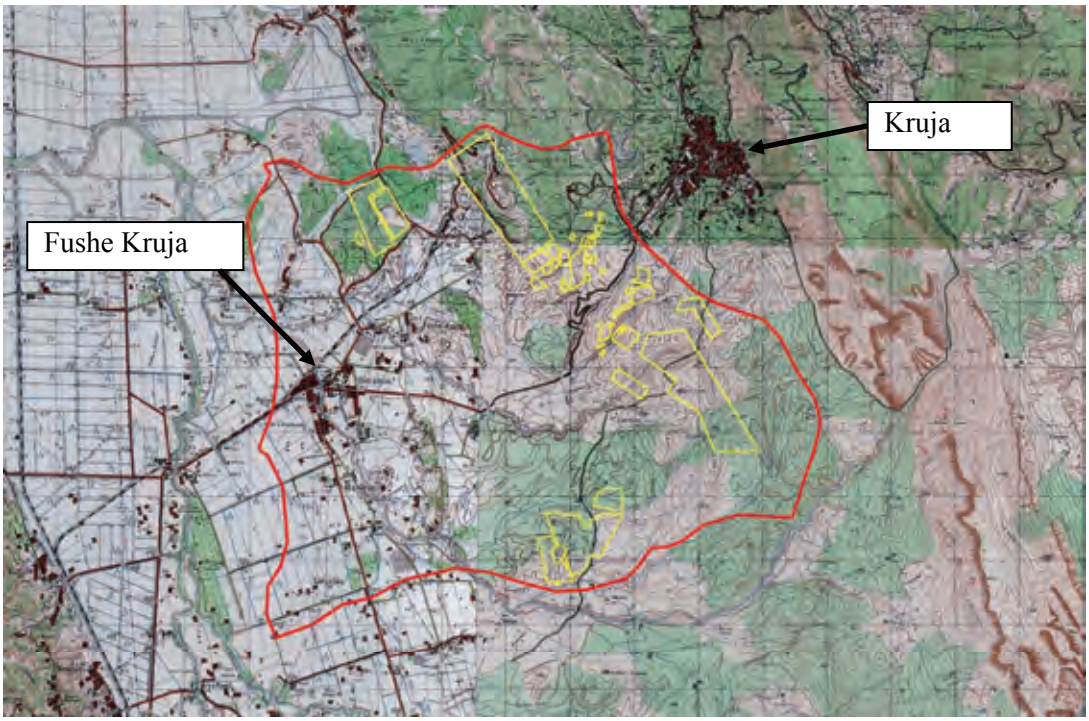


Figure 4.5.11 Distribution of limestone licenses in Kruja area

（Ura Vajgurore、Berat）

Photograph 4.5.1 Limestone quarry close to residential area

2) Lack of resource information

Although prospective non-metallic resources of Albania have potentiality of attracting interest of domestic and foreign investors, it is difficult for investors to find proper locations of investment because of lack of information. Further, some cases of unsuccessful investment because of lack of information were known. After establishment of quarry for exploitation of sandstone slab, it was realized at the production stage that exploited sandstone slab had so many fractures and it was impossible to obtain sandstone slab of necessary size. Another example is that after starting of

exploitation of plagioclase granite for decorative stone in quarry, it was realized that the color of exploited plagioclase granite was different from the color that market wanted. Enough assessment of non-metallic resources, therefore, is necessary before making investment for exploitation. Since the investors of non-metallic resources are normally small companies without enough funds for assessing non-metallic resources, they tend to apply for license and start exploitation activities without having enough information of resources. For promoting investment for non-metallic resources, it is necessary to supply sufficient information including assessment of resources to investors.

3) Material flow

It is necessary to establish efficient systematic material flow boosting output in quarries to final market including processes of exploitation-processing-transportation-marketing-exportation. Since exploitation of non-metallic resources is conducted by many small companies, systematic efficient material flow is not observed.

4.5.12 Strategy for Development of Non-metallic Resources

The purpose of the strategy is to make best use of non-metallic resources existed in Albania for the benefit of the country and people living there. There are many licenses of non-metallic resources including unnecessary ones and some of license areas are located in improper site. Reconsideration of these licenses is necessary. For promotion of investment, it is necessary to properly understand and organize information of resources and the information can be accessible for domestic and foreign investors. Further, with the increase of production, it is necessary to establish efficient material flow.

1) Reconsideration of licenses by AKBN

A total of 423 exploitation licenses of non-metallic resources are registered and more than half of 233 licenses (55%) have no production in 2009. Among 233 licenses of no production, some of the companies (34 licenses) had investment in 2009 for preparation of future exploitation work. But most of the no production companies had no investment and no employee and it is doubtful whether owner of these companies have intention of future exploitation activities. These dormant licenses prevent ambitions new comers trying to start exploitation activities. According to the mining law, exploitation licenses of these non-metallic resources have duration of twenty years. It is necessary for AKBN to conduct monitoring of concession more strictly The intension of further exploitation activities in future of these concessions should be confirmed from the owner through monitoring activities of concession conducted twice a year. If there is no exploitation activity planed in future, strict action should be taken.

Without enough consideration of environmental problems, license areas with quarry are often found close to residential area or in the area with hazardous topography. The guideline of issuing license should be reconsidered to issue licenses with enough environmental considerations. The area of exploitation activities should be designated in certain zones of area on each non-metallic resource basis. This practice would be feasible solution because, unlike metallic resources, non-metallic resources have a quite wide target area for exploitation.

2) Organizing information of non-metallic resources by coordination of AKBN and AGS

Study of non-metallic resources is included in functions of the promotion sector of AKBN. In 2009, two studies of non-metallic resources “Promotion of Albanian bauxite resource” and “Promotion of decorative stones of igneous origin” are conducted. Further, various examinations of non-metallic resources including measurement of physical properties are conducted in AKBN. While, in GSA, seven staff of Mineral Resources Department are assigned for non-metallic resources and they are conducting geological survey for understanding quality and quantity of non-metallic resources. But these two institutions are conducting survey and collecting information, separately.

The information of non-metallic resources is not enough and not well organized yet, and more survey and studies are necessary. It is strongly recommended that AKBN and AGS should work together for non-metallic resources by coordination. The current information concerning non-metallic resources owned by AKBN and AGS should be integrated and catalog of the prospective locations should be prepared. Results of geological survey, drilling survey, chemical nature, physical nature and rank of priority should be included in the catalog. Efforts should be made trying to obtain new information by conducting survey and making examination, and the information of catalog should be revised for each time new data is acquired. Particularly for the more prospective locations, it is necessary to understand geological and physical natures of underground by drilling. The catalog of prospective location should be accessible for domestic and foreign investors for promotion of investment to non-metallic resources.

3) Establishing optimal material flow

Since exploitation of non-metallic resources is conducted by mostly many small companies, establishment of systematic efficient material flow including processes of exploitation-processing-transportation-marketing-exportation is necessary. Exploitation activities of sectors of industrial materials (limestone, basalt) and decorative stones (limestone, sandstone and ophiolite rocks) are particularly conducted by small companies. It is necessary to bring further development of this sector by establishing integrate system from quarries to final market. The effort for this should be done by an initiative of METE and AKBN.